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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

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80-3001. Hrdy, I. (Dep. Insect Toxicol., Entomol. Inst., CSAV, Prague, Czechoslovakia) **Insekticidy v integrovane ochrane rostlin. [Insecticides in integrated pest control.]** *Agrochemia* 20(7): 205-214; 1980 (31 references) (Czech).

Integrated pest management (IPM) takes into account the total environment and the population dynamics of the pest and maintains the pest population below the level where it can cause appreciable damage. It calls for the application of all acceptable economic, ecological, and, where necessary, toxicological methods. In apple orchards, for example, IPM makes it possible to reduce consumption of fungicides, acaricides and pesticides by 20-55% as compared to conventional control methods (France, Switzerland, BRD). IPM observes the principles of sound agricultural practices, optimizes biomass production by influencing photosynthesis and bionitrification processes, works at improving the genetic characteristics of seedstock, uses biological control methods wherever feasible, applies best available specific pesticides with lowest adverse effects on soil and crops, and draws phytopathologists and entomologists into the control method decision-making process. IPM is currently very important because of the dramatic increase in the resistance of pests to chemical control agents.

80-3002. Veselovskii, I. V.; Kariamo, S. Kh. D. (Ukrainian Agric. Acad., Kiev, USSR) **Vliyanie gerbitsidov Ramroda i Sutana na pitatel'nyi rezhim pochvy, urozhai i kachestvo zerna kukuruzy. [Effect of herbicides Ramrod and Sutan on nutritional regimen of the soil, yield, and quality of corn grain.]** *Agrokhimiya* 6: 105-108; 1980 (12 references) (Russian).

The results of field trials of the herbicides Ramrod (propachlor) and Sutan (butylate + R-25788; 8 kg/ha) in corn crop are reported. Both herbicides were found to provide effective control of annual weeds and had no negative effect on the corn or rotation crops. Sutan residues in the corn ranged from 0.12 to 0.16 mg/kg, while corn was free of Ramrod residues. Herbicides increased the amount of mobile forms of soil nutrients.

80-3003. Polizu, A. (Inst. Cercet. Pentru Prot. Plant, Bucharest, Romania) **Absorbtia radiculara si translocatia unor compusi analogi din grupa DDT in plantula de porumb. [Root absorption and translocation of some DDT analogs in maize seedlings.]** *An. Inst. Cercet. Prot. Plant Acad. Stiinte Agric. Silvice* 14: 271-280; 1978 (8 references) (Rumanian).

Absorption of DDT by maize plants started immediately upon exposure. Significant residues were noted as early as 6 hr after application. Residues accumulated in the seedlings in increasing amounts as the time of exposure lengthened. Massive accumulations were found in the roots and only low accumulations in the stem and leaves. At a concentration of 1 mg AI/l, the accumulation in the roots, stem and leaves were 0.355 ppm, 0.016 ppm, and 0.030 ppm, respectively. When exposed to methoxychlor, residues were 1.781 ppm in roots and 0.038 ppm in stems, with no residues found in the leaves. Corn plants accumulated low quantities of methylchlorine and high amounts of methoxychlor.

80-3004. Van Auken, O. W.; Hulse, M. (Div. Environ. Sci. & Eng., Southwest Res. Inst., San Antonio, TX 78284) **Translocation, distribution, and environmental degradation of hexachlorophene in tomatoes.** *Arch. Environ. Contam. Toxicol.* 8(2): 213-230; 1979 (37 references).

Tomato plants were treated with leaf-applied hexachlorophene (HCP). Translocation of hexachlorophene from the plant leaves did not occur. No metabolites were found. A slight amount of HCP was lost from the leaves. After 70 days 89.5% of the applied HCP remained unaltered on the treated plants. The hexachlorophene which was altered appeared to have been acted upon by ultraviolet photolysis. Three extracted chlorinated compounds were identified including 2,2′-dihydroxy-3,5′,6,6′-tetrachlorodiphenylmethane, 2,2′-dihydroxy-3,5,5′,6,6′-pentachlorodiphenylmethane, and 2,2′-dihydroxy-3,3′,5,5′6,6′-hexachlorodiphenylmethane.

80-3005. Davies, J. M.; Mabuchi, K.; Lilienfeld, A. M. (Dep. Epidemiol., Inst. Cancer Res., Sutton, Surrey SM2 5PX, England) **Letter to the editor.** *Arch. Environ. Health* 35(2): 123-124; 1980 (2 references).

In this letter to the editor, 3 questions are raised on the data reported in an earlier paper on lung cancer in pesticide workers. Clarification was given in a reply by the authors of the original article. Corrections are given for some of the data. Untraced individuals were assumed to be still alive, so that the reported SMR is a minimum estimate. Methods for analysis by length of exposure are discussed. It is noted that there are strong correlations among duration of employment, aging and calendar time. In this study, the authors chose to use age- and calender-time specific rates.

80-3006. Beck, J. R., ed. (Biol. Environ. Consult. Serv., Detroit, MI) **Vertebrate Pest Control and Management Materials.** *ASTM STP 680* 323 pp.; 1978.

A symposium sponsored by the American Society for Testing and Materials was held in Monterey, California in March of 1978. Continuing in the format of a first symposium on avian and mammalian wildlife toxicology, this second symposium encompassed work in the control of vertebrate pests in both field and laboratory studies. The use of integrated pest management programs is greatly emphasized and a concern for human and environmental safe-

ty is highlighted in many of the papers presented. Practical economic guidelines are also offered in relation to vertebrate pest control. Commensal rodents, native mammals and forage and seed depredations, predators and canine depredations and general test support considerations are covered. Each paper includes an abstract and reference. A general index appears at the end of the symposium proceedings. [Papers presented at this symposium will appear in appropriate sections of this issue of *Pesticides Abstracts.*]

80-3007. Frantz, S. C. (Rodent Control Eval. Lab., New York State Dep. Health, Troy, NY 12182) **Procedures for sampling urban rat populations for anticoagulant resistance evaluation.** *ASTM STP 680* pp. 20-28; 1978 (15 references).

Techniques for sampling urban rat populations developed by the New York State Department of Health in conjugation with anticoagulant rodenticide resistance programs are outlined. Preliminary tests point to the need for more stringent standards governing rat collection. It was reported that early collection methods provided only a rough indication of the presence or absence of anticoagulant resistance. Guidelines are offered for planning trap-sampling programs for various US project cites. To gain statistically sound data on urban rat populations, rats should be trapped in sufficient numbers and in a well-distributed manner. Procedures for the statistical analysis of the collected data are given. The possibilities of applying the method to assess anticoagulant resistant rodents in urban areas throughout the world are discussed. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3008. Peardon, D. L.; Ware, J. E.; Peacock, D. B.; Matheny, R. W. (New Ventures Res., Rohm & Haas Co., Spring House, PA 19477) **Test method for evaluating the efficacy of rodenticides against anticoagulant-resistant Norway rats.** *ASTM STP 680* pp. 45-49; 1978 (9 references).

A laboratory test is described which is used to evaluate the efficacy of rodenticides against anticoagulant-resistant Norway rats. Feeding tests are conducted on trapped field rats to isolate individuals resistant to warfarin and one of the 1,3-indiandione anticoagulants. Survivors of a regimen of 3 consecutive anticoagulant treatments each separated by a 30-day cleansing period are considered cross-resistant rats. These anticoagulant-resistant animals are then treated with the candidate rodenticide to evaluate its efficacy. In tests on 20 cross-resistant Norway rats where RH-787 [the active ingredient in Vacor (pyriminil)] was offered in the food for 3 consecutive days, 90% of the rats died by day 8. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3009. Wade, D. A.; Beasom, S. L. (Texas A&M Univ., San Angelo, TX) **The effects of environmental-political factors on predator research.** *ASTM STP 680* pp. 294-303; 1978 (55 references).

An overview of the environmental and political factors affecting predator research is presented beginning with a brief historical account of predator damage and control in the United States from colonial times to the present. The circumstances which brought about research on coyote control are mentioned. In 1971, the Gain Committee supported legislation to prohibit the use of toxicants in predator control on the grounds that they were inhumane and damaging to non-target organisms. In 1972, the Nixon administration prohibited the use of such toxicants in federal programs and federal lands. Studies on predator research are reviewed with emphasis on coyote control by the Coyote-getter, thallium, 1080 (sodium fluoroacetate), strychnine, carrion stations and reproductive inhibitors. More recent studies on coyote control included tests using toxic collars containing sodium cyanide, diphacinone, and 1080. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3010. Kenaga, E. E., ed. (Dow Chem. Co., Midland, MI 48640) **Avian and mammalian wildlife toxicology.** *ASTM STP 693* 97 pp.; 1979.

Proceedings of the first ASTM Avian and Mammalian Wildlife Toxicology Symposium held in October 1978 in New Orleans are presented. Eight papers are given covering the typical problems encountered in studying wild birds and mammals as indicators of environmental pollution by various toxic chemicals. Some of the topics discussed include EPA regulations for wildlife toxicity testing, studies on environmental pollution done at the Patuxent Wildlife Research Center, acute hazard assessments in simulated field situations, evaluation of the effects of oil on seabirds, and the identification of acute toxins in whole bodies and bait without chemical analysis. Other presentations which examine aspects of pesticidal compounds include papers on chlorpyrifos, 12-ketoendrin and endrin, and diphacinone. A general index is provided at the end of the symposium proceedings. [Papers presented at this symposium will appear in appropriate sections of this issue of *Pesticides Abstracts.*]

80-3011. Fink, R. J. (Wildl. Int. Ltd., Easton, MD 21601) **Simulated field studies - acute hazard assessment.** *ASTM STP 693* pp. 45-51; 1978.

Pesticidal toxicity is often initially evaluated by acute and subacute laboratory tests which may also serve as a preliminary assessment of acute environmental hazard. Simulated field tests may be used to interpret laboratory indicator studies and predict possible hazards under natural conditions. The extent to which a planned field test simulates actual conditions determines the validity of its

results. Simulated field tests should include the use of nontarget species which are indigenous to the area where the pesticide will be applied. They should also conditions compatible to the habitat of the animal model selected and simulate standard agricultural practices as much as possible. Close observations of each test animal should be made and the experiment should be carried out long enough so that adequate evaluations of pesticidal effects may be obtained. [Paper presented at the 1978 ASTM Avian & Mammalian Wildlife Toxicology Symposium]

80-3012. Beaumont, G.; Lord, A.; Grenier, G. (Dep. Biol., Fac. Sci., Univ. Sherbrooke, Sherbrooke, Quebec J1K 2R1, Canada) **Effets physiologiques de l'atrazine a doses subletales sur *Lemna minor*. V. Influence sur l'ultrastructure des chloroplastes. [Physiologic effects of sublethal doses of atrazine on *Lemna minor*. V. Influence on chloroplast ultrastructure.]** *Can. J. Bot.* 58(14): 1571-1577; 1980 (18 references) (French).

Atrazine at a sublethal level of 0.25 ppm caused many ultrastructural alterations in the chloroplasts of mesophyll cells of *Lemna minor* L. under aseptic growth conditions in a mineral solution. A disappearance of the intralamellar vesicles was observed and the number of grana per chloroplast increased. Outgrowths were noted at the end of chloroplasts, and the stroma of treated chloroplasts was reduced and displayed osmiophilic globules. Chloroplast grana had decreased numbers of lamellae and formed a dense network pattern.

80-3013. Marshall, V. C. (Dir. Saf. Serv., Univ. Bradford, Bradford, England) **Seveso, an analysis of the official report.** *Chem. Eng. (London)* 358: 499-500, 516; 1980 (3 references).

This report reviews the voluminous Official Report of the Parliamentary Commission of Inquiry into the escape of toxic substances at the ICMESA establishment in Seveso, Italy, on October 7, 1976. The report identifies several areas where mistakes occurred and the combination of these individual mistakes which led to the disaster. The company changed the original Givaudan process for the manufacture of 2,4,5-trichlorophenol. The first change increased the molar concentrations of sodium hydroxide, and the second change, distilling off the xylene before acidification, increased the contact time between sodium hydroxide and the glycol, permitting more time for the sodium trichlorophenate to condense with itself. On the mechanical side, no provision had been made for automatic water cooling of the reactor. Also, no provision was made for a trapping system for the vented contents of the reactor. Finally, the consequences of the incident were greatly aggravated by the failure of the company to immediately alert local authorities to the corrosive nature of the discharge and to the fact that it possibly contained dioxin.

80-3014. Hardy, N. G. (Author address not given) **Pesticides - what's good, what's bad?** *Citrus Ind.* 61(4): 10, 13; 1980.

Currently in Florida there is concern over the use of chlorobenzilate to control citrus rust mites. Use of chlorobenzilate is restricted to licensed operators. The chemical is usually applied once, or twice a year, postbloom and during the summer. Concerns over the amount of exposure the operator is receiving during application are being examined. Various methods of protection for the operator are being tried. One major problem is that the operators do not wish to wear hot, heavy, uncomfortable respirators. Recent studies on mice and rats have indicated that chlorobenzilate is a carcinogen and produces testicular atrophy in rats.

80-3015. Izenberg, D. (Author address not given) **Battle bugs with love trap.** *Citrus Ind.* 61(4): 61-62; 1980.

The use of sex attractants in efforts to control insect pests is discussed. During the mating season, male insects are attracted by pheromones emitted by females. Isolating the pheromone and preparing adequate amounts of the chemical is the first step. After sufficient quantities are produced the pheromone can be used in a number of ways. One of the most common is monitoring, in which the pheromone is fastened to a crop with a gluey transparent panel. The male is attracted and trapped. By counting the number trapped per wk and recording this over a period of time, the populations of these bugs in the fields can be determined. When the bug population is at its peak, a chemical spray can be used to kill the most bugs with the smallest amount of chemical. Confusion and sterilization methods are also described. There are also antipheromones which modify the pheromone substance to inhibit the attractive power of the natural pheromone being diffused by females in the field.

80-3016. Amer, S. M.; Farah, O. R. (Lab. Genet. & Cytol., Natl. Res. Centr., Cairo, Egypt) **Cytological effects of pesticides. IX. Effects of the phosphonothioate insecticide leptophos on *Vicia faba*.** *Cytologia* 44(4): 907-913; 1979 (14 references).

Studies were performed to determine the effects of leptophos on mitosis in the root of *Vicia faba*, since the insecticide has been detected in soil up to 3 mo after application. Seeds and roots were exposed to a saturated solution, as well as 0.5, 0.25 and 0.125 dilutions of the saturated solution. The percentage of abnormal mitoses was 40.79% after 72 hr of saturated solution seed-soak treatment, as compared to 1.69% for controls. Root treatment with the various concentrations resulted in abnormal mitoses ranging from 5.06% for the most dilute to 16.36% for the saturated solution. Seed-soak treatment with a saturated solution caused about a 10% reduction in germination, a reduction by about 50% in root growth after 72 hr, and a reduction in shoot growth of about 50%.

80-3017. Pinto, H. (North Carolina State Univ., Raleigh, NC) **Uptake, translocation, and metabolism of tetrafluron by cotton, jimsonweed, peanuts and prickly sida.** *Diss. Abstr. Int. B* 40(1): 16; 1979.

The uptake, translocation and metabolism of ring-labeled ^{14}C-tetrafluoron in 10 and 14-day-old seedlings and in excised leaves of cotton, jimsonweed, peanut, and prickly sida were investigated. Evaluations were made after 6, 12, 24 and 48 hr of exposure to either 10 or 20 μg ^{14}C-tetrafluoron in liquid culture. Striking differences were observed in uptake and translocation between crops and weeds. Uptake and subsequent translocation were limited in peanut, intermediate in cotton, and very high in jimsonweed and prickly sida. Uptake of ^{14}C-tetrafluoron increased with time in the 10 and 14 day old seedlings. Methanol extracted ^{14}C increased with time and was higher for the weed species than for the crop plants. Autoradiographs demonstrated more rapid absorption and translocation of radioactivity in jimsonweed and prickly sida than in cotton and peanut. Tetrafluoron was transformed rapidly in cotton shoots into monomethyl and desmethyl metabolites and conjugated glycosides at 6 hr after treatment in 10 (96%) and 14 day-old-seedlings (100%). Cotton roots were less effective than shoots. The amount of ^{14}C-tetrafluoron metabolized by shoots and roots of jimsonweed, cotton and prickly sida increased from 6 to 48 hr and with the age of the seedlngs. Equivalent amounts of tetrafluoron were metabolized in cotton excised leaves and seedlings. More than 98% of the ^{14}C-tetrafluoron initial dose was metabolized during the first 6 hr. The results demonstrated the remarkable capacity for the metabolism of tetrafluoron in cotton seedlings and located the leaves as the main metabolic center. Tetrafluoron metabolites present in the methanol extracts were identified by thin layer chromatography. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7915543)

80-3018. Bohn, J. A. (Univ. Kentucky, Lexington, KY 40506) **Quantitative structural relationships to physiological activity of diphenyl ether herbicides.** *Diss. Abstr. Int. B* 41(2): 429; 1980.

Twenty-five diphenyl ether compounds were evaluated to determine quantitative structure-activity relationships in isolated mitochondria, chloroplasts, protoplasts and intact leaf tissue. Compounds evaluated included oxyfluorfen and 3 derivatives, bifenox and 7 derivatives, 5-(2,4-dichlorophenoxy) -2-nitrobenzoic acid and 7 derivatives (the 4-trifluoromethyl derivative, sodium salt, is acifluorfen), nitrofluorfen and 3 derivatives (the 4-chlorobenzene derivative is nitrofen), and diphenyl ether. Diphenyl ether compounds which contained carboxyl groups were not active in isolated organelles. Nitrofen, nitrofluorfen, oxyfluorfen, diphenyl ether and 4 of the derivatives increased inhibition of uncoupled malate oxidation in corn *(Zea mays* L) mitochondria in a dose-dependent manner. Inhibition of malate oxidation was primarily due to inhibition of electron transport. The same compounds, except for oxyfluorfen, inhibited coupled electron transport in isolated pea *(Pisum sativum* L) chloroplasts in a dose-dependent manner. Diphenyl ethers partially (20-50%) interfered with adenosine triphosphate synthesis and inhibited electron transport in chloroplasts. Inhibition of photosynthetic electron transport by diphenyl ether compounds in wheat *(Triticum aestivum* L em Thell) protoplasts did not differ from pea chloroplasts, indicating that the plasmalemma is not a barrier to these compounds. Only diphenyl ether herbicides increased electrolyte leakage from treated cocklebur, tall morningglory, velvetleaf and soybean leaf tissue. Alteration of the structure of diphenyl ether herbicides made them inactive. Herbicides with trifluoromethyl groups were more active than herbicides with chloro groups. Qualitative structure-activity models were developed for diphenyl ether compounds in mitochondria, chloroplasts, cocklebur, tall morningglory and soybeans. Chemical parameters used in the models were Hammett electronic constants, Fujita hydrophobic binding constants and Verloop steric constants. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8018227)

80-3019. Winkle, M. E. (Univ. Nebraska, Lincoln, NE 68508) **Effects of weed density, herbicide antidotes and soil adsorption on herbicide bioactivity.** *Diss. Abstr. Int. B* 41(2): 433; 1980.

Herbicide bioactivity was decreased with increased weed densities, with herbicide antidotes, and from herbicide adsorption to soil organic matter and clay. Increasing densities of white mustard and foxtail millet resulted in increased atrazine and alachlor concentrations required to produce equivalent fresh weight reductions in greenhouse bioassays. Herbicide uptakes (fresh weight basis) decreased as seeding rate increased for both herbicides in field and laboratory applications. Tank mixes (8:1 herbicide:antidote) of R-25788 (*N,N*-diallyl-2, 2,-dichloroacetamide) and H-31866 (*N*-allyl-N-(3, 3-dichloroallyl) dichloroacetamide) with alachlor and metolachlor on a Sharpsburg silty clay loam and Tripp sandy loam provided good crop protection for corn in a greenhouse bioassay. In a field experiment, CGA-43089 [(α-cyanomethoxyimino)-benzacetonitrile] seed treatment (1.25 g/kg) applied to sorghum seed before planting was found to be more effective than the R-25788 tank mix in countering the phytotoxic effects of alachlor and metolachlor. In laboratory experiments, CGA-43089 did not affect the uptake, distribution, or metabolism of ^{14}C-labeled metolachlor in sorghum. Atrazine and alachlor activity as measured by GR50 (concentration required for 50% growth inhibition of test species) decreased with increasing adsorption to 9 Nebraska soils. Positive correlation coefficients resulted between GR_{50} and adsorption coefficient, herbicide mobility, percent organic matter, cation exchange capacity, and percent clay. Organic matter and clay content were found to be most important factors governing soil adsorption and

subsequently herbicide bioactivity. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8017629)

80-3020. Majid, N. A. (Utah State Univ., Logan, UT) **An investigation of physiological and biochemical effects of methyl 2-(4-(2,4-dichlorophenoxy)phenoxy) propanoate in wild oat and barley.** *Diss. Abstr. Int. B* 41(3): 759; 1980.

The physiological and biochemical actions of diclofop-methyl in wild oat *(Avena fatua* L.) and barley *(Hordeum vulgare* L. var. GEM S168) were investigated in greenhouse growth chamber and laboratory to establish the absorption, translocation and distribution patterns and evaluate the effects of this herbicide on RNA and protein synthesis in the test species. Further studies were conducted to determine the role of environmental factors such as temperature, photoperiod, surfactants and growth regulators on the phytotoxicity of this herbicide to wild oat and to compare anatomical and histochemical changes induced by this compound in treated plants with untreated controls. Diclofop-methyl was not mobile in the test species and most of the applied dosage remained either unabsorbed on the leaf surface or after absorption stayed in the leaf cuticular layer or parenchyma cells. Very limited amounts translocated from the site of uptake to other plant parts. Translocation and distribution patterns of this herbicide apeared similar in both susceptible oat and tolerant barley. Differential absorption of ^{14}C-diclofop-methyl appeared to be the major contributor towards selectivity among the test species. Incorporation of ^{14}C-uridine into RNA and ^{14}C-leucine into proteins were differently inhibited in susceptible wild oat and tolerant barley. More RNA and protein were synthesized in treated barley than in treated wild oat coleoptile segments both before and after herbicide treatment. Environmental factors play major roles in determining the toxicity of diclofop-methyl to wild oats. Phytotoxicity increased with increasing temperature with an optimum at about 27°C.) Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8019235)

80-3021. Ritter, R. L. (North Carolina State Univ., Raleigh, NC) **Environmental factors affecting the penetration, translocation and phytotoxicity of acifluorfen (5-(2-chloro-4-(trifluoromethyl) phenoxy)-2-nitrobenzoic acid).** *Diss. Abstr. Int. B* 41(3): 768; 1980.

Investigations were undertaken to study: the influence of temperature and relative humidity on the herbicidal activity of acifluorfen; the effects of post-treatment simulated rainfall on acifluorfen activity; the influence of soybean canopy and stage of weed growth upon acifluorfen performance; and the penetration, translocation, and metabolism of acifluorfen in soybean, common ragweed and common cocklebur. Acifluorfen application made to the foliage of the weeds under high relative humidity (85 ± 5%) caused an increase in phytotoxicity and a decrease in dry wt as compared to plants treated under low relative humidity (50 ± 5%). Temperature (32°C day, 22°C night *vs.* 26°C day, 16°C night) was not as critical a factor in the phytotoxicity of acifluorfen. The addition of a non-ionic surfactant to acifluorfen increased the phytotoxicity (regardless of temperature or relative humidity) to both weed species, but also provided increased phytotoxicity and resulting decrease in fresh wt to soybean plants. Within 24 hr after application to mature leaves of common ragweed, common cocklebur, and soybean, little movement of ^{14}C-acifluorfen from the leaf surface occurred. For soybean plants, most of the ^{14}C remained on the leaf surface 48 hr after application. Autoradiographs of the soybean plants showed no movement from the treated leaflet. Thin layer chromatography suggested that acifluorfen was metabolized within the plants. Rate of metabolism was inversely related to plant susceptibility (common ragweed and common cocklebur > soybean). The more rapid penetration and translocation coupled with slower metabolism of acifluorfen by weed species in comparison to the soybeans are factors which may account for the difference in susceptibility of the weeds and soybeans to acifluorfen. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8020507)

80-3022. Mehrle, P. M.; Mayer, F. L. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Clinical tests in aquatic toxicology: state of the art.** *Environ. Health Perspect.* 34: 139-143; 1980 (20 references).

Techniques for assessing the hazards of chemicals to aquatic organisms are reviewed, with emphasis on the problems associated with developing diagnostic tests for fish. It is pointed out that diagnostic tests available to fish toxicologists are not as extensive as those used by mammalian and veterinary toxicologists, since aquatic toxicology is a relatively new field. In a recent workshop, the relative utility of eleven toxicity tests was evaluated, and it was determined that acute lethality tests highest, followed by embryo-larval tests, chronic toxicity tests measuring reproductive effects, and residue accumulation studies. Histological tests ranked ninth, and physiological and biochemical tests tenth. The problems involved in developing appropriate techniques include the fact that the understanding of physiological and biochemical regulatory mechanisms in fish is limited, and the difficulties in correlating toxicant-induced physiological and biochemical responses with an important whole-animal response critical to species or population survival. To illustrate these problems, studies on effects on endrin and dieldrin on rainbow trout and effects of heavy metals on brook trout are cited. Considerations for development of useful tests are presented, and the authors suggest that researchers must conduct biochemical, physiological and histopathological investigations in conjunction with toxicity studies that measure important whole-animal responses.

80-3023. Chenevert, R.; Perron, J. M.; Paquin, R.; Robitaille, M.; Wang, Y. K. (Dep. Chim. Biol., Fac. Sci. Genie, Univ. Laval, Laval, Quebec G1K 7P4, Canada) **Activity of precocene analogs on *Locusta migratoria migratoriodes* (R. and F.).** *Experientia* 36(4): 379-380; 1980 (10 references).

Several analogs of precocene have been synthesized and evaluated as potential inhibitors of juvenile hormone on *Locusta migratoria.* Only 5,7-dimethoxy-2,2-dimethylchromene was active; its ED50 and LD50 were measured and compared to those of precocene I and II. Of the 6 new compounds synthesized, all were more or less toxic to locust nymphs, but only the 5,7-dimethoxy compound produced precocious metamorphosis when applied as a single dose of up to 1500 μg/nymph. Thus any change in precocene results in substantial loss of activity, and the double bond is an essential feature for the activity of precocone.

80-3024. Vanhaelen, M.; Vanhaelen-Fastre, R.; Geeraerts, J. (Inst. Pharm., Free Univ. Brussels, B-1050 Brussels, Belgium) **Occurrence in mushrooms (Homobasidiomycetes) of *cis*- and *trans*-octa-1,5,-dien-3-ol, attractants to the cheese mite *Tyrophagus putrescentiae* (Schrank) (Acarina, Acaridae).** *Experientia* 36(4): 406-407; 1980 (7 references).

Cis- and *trans*-octa-1,5-dien-3-ol were identified in 15 Homobasidiomycetes; these compounds exhibited a significant attraction for the cheese mite *Tyrophagus putrescentiae* (Schrank) (Acarina, Acaridae). The mushrooms collected were crushed with anhydrous sodium sulfate. Volatile materials were removed from the mixture at room temperature for 72 hr by nitrogen flow and preconcentrated on Tenax GC. The volatiles thus collected are representative of the odor produced by the mushrooms, and were subsequently analyzed by GLC. A significant attraction was found for dilutions of volatile materials equivalent to quantities lower than 100 mg of *Coprinus atramentarius.* (Author abstract by permission, supplemented)

80-3025. Boneta Garcia, E. G. (Adjuntas Substn., Agric. Exp. Stn., Mayaguez Campus, Univ. Puerto Rico, Rio Piedras, Puerto Rico) **Frequency of herbicide applications to coffee groves.** *J. Agric. Univ. P. R.* 64(3): 249-258; 1980 (5 references).

The application of Dowpon (dalapon), Gramoxone (paraquat) and Karmex (diuron) to coffee groves for weed control was studied. The addition of Karmex to Gramoxone or Dowpon solutions was found to adversely affect coffee growth. Karmex (2.26 kg/ha) + Gramoxone (0.95 l/ha) every 12 wk resulted in 23 dead coffee trees and 12 injured. Gramoxone alone (0.95 l/ha when needed) produced only 1 dead and 2 injured trees. Dowpon alone applied every 12 wk at 5.65 kg/ha or every 16 wk at 10.3 kg/ha resulted in 2 dead and 2 injured trees, and 0 dead and 1 injured tree, respectively. Dowpon (5.6 kg/ha) + Karmex (1.13 or 2.26 kg/ha) every 12 or 16 wk resulted in 3-11 dead and 3-8 injured trees. The use of Karmex on recently transplanted or young coffee plantations is not recommended.

80-3026. Fink, D. J. (Vet. Admin. Hosp., Long Beach, CA) **Exposure to Agent Orange.** *J. Am. Med. Assoc.* 244(10): 1094-1095; 1980 (1 reference).

In this letter to the editor, a previous study on the symptoms of Vietnam veterans exposed to Agent Orange (a herbicide composed of 2,4-D + 2,4,5-T, and contaminated with TCDD) is criticized on the grounds that the report may be misleading to Vietnam-era veterans and their physicians. It is pointed out that the author of the study does not explain the selection of his test population or the extent of their exposure. Other criticisms of the study include neglect of tests to document herbicide exposure, and failure to compare the study group with an age-matched unexposed population. It is pointed out that without the use of a reference population, the symptoms found in the study group cannot be causally linked with exposure to Agent Orange. While TCDD may cause chloracne and mild hepatic disorders, there is no scientific evidence that this contaminant produces some of the other symptoms reported in the study under attack. It is suggested that other somatic and psychlogical conditions be researched as the cause of some of the maladies found in the Vietnam veterans studied rather than attribute them all to exposure to Agent Orange.

80-3027. Neumark, S.; Teich, I. (Div. Pests & Dis., Plant Prot. Dep., Min. Agric., Jaffa, Israel) **Antagonistic effects of two synthetic sex pheromones on catches of the cotton pests *Pectinophora gossypiella* and *Spodoptera littoralis.*** *J. Environ. Sci. Health A* 15(4): 307-312; 1980 (5 references).

Field tests were conducted on the simultaneous use of the insect pheromones gossyplure and prodlure in traps to capture male pink bollworm moths and *Spodoptera littoralis* moths. A definite antagonistic effect of the 2 pheromones was observed. A permanent reduction in pink bollworm catches and temporary reduction in *S. littoralis* catches was found with both pheromones in the same trap or in different traps located as far as 0.5 m apart.

80-3028. Neumark, S.; Teich, I. (Div. Pests & Dis., Plant Prot. Dep., Minist. Agric., Jaffa, Israel) **A dry and open pheromone trap activated by 4% diazinon for trapping male moths of *Spodoptera littoralis* Boisd.** *J. Environ. Sci. Health A* 15(4): 313-321; 1980 (10 references).

An improved biological control trap for capturing

large numbers of male *Spodoptera littoralis* moths in the field is described. The trap is dry and open and is dusted on the inside walls with 4% diazinon, thus preventing escape of the moths once inside. The moths are attracted to the trap by a dispenser releasing synthetic insect sex pheromone. The trap retains its effectiveness for 4 wk. The advantages of the open trap were demonstrated over 4 other types of traps. Volatility of the pheromone placed outside the trap, easy access to the inside of the trap by the moths, and the dusting of the inside of the trap were the most effective. The second most effective traps was similar; only the diazinon was omitted.

80-3029. Dzhashi, V. S.; Bakanidze, M. Sh.; Nikolaishvili, A. A. (All-Union Res. Inst. Tea Subtrop. Crops, USSR) **Insektitsidy protiv gusenits chainoi moli. [Insecticides against larvae of tea moth.]** *Khim. Sel'sk. Khoz.* 18(5): 39-40; 1980 (Russian).

The effect of insecticides (used against tea moth) on physiological activity and biochemical composition of tea leaves was studied. Spraying with 0.2% solutions of Phosphamide (dimethoate standard), actellic (pyrimiphos-methyl), cyanox (cyanophos), Ts-9491, Elsan (phenthoate), amiphos, DDVP (dichlorvos), and basudin (diazinon) did not inhibit metabolism in tea plants. Treatment with amiphos, Phosphamide, DDVP, and basudin resulted in temporary decreases of catalase activity. Insecticides did not change the level of nitrogen and carbohydrates in tea leaves.

80-3030. Anonymous **Bugs combat 2,4-D damage.** *Lab. Pract.* 29(3): 815; 1980.

Bacteria are used for combating toxic chemical pollutants at Battell's Columbus Labs. Microorganisms are transforming or degrading chemicals such as DDT or 2,4-D into innocuous or easily disposed products. It is hoped that the bacteria can be used as fertilizers after their clean up work is accomplished. Work is being done on improving the strain, and improving the efficiency with which the chemicals are being metabolized.

80-3031. Chin, K.; Beattie, T. J. (Dep. Child Health, R. Hosp. Sick Children, Yorkhill, Glasgow G3 8SJ, Scotland) **Household product poisoning in children.** *Lancet* 2(8187): 206; 1980.

Case records for accidental poisonings of children entering a hospital are summarized. Between 1969 and 1978, 1906 children were admitted due to accidental poisoning; 330 were because of household products. More than 30 different brands of products were encountered. Of the poisonings due to household products 3.6% were attributed to herbicides. Except when corrosive or highly toxic products were involved, the results were seldom serious. Often, liberal intake of fluids and a demulcent were the only treatment required. Parents are urged to keep household products out of the reach of children and manufacturers are urged to use childproof containers for more toxic products.

80-3032. Vladimirskaya, M. E.; Vytskii, V. A.; Lukovnikova, G. A. (All-Union Inst. Plant Prot., Leningrad, USSR) **Vliianie fungitsidov na nekotorye khimicheskie pokazateli zdorovykh i porazhennykh *Plasmodiophora brassicae* Wor. tkanei korneploda turnepsa. [Effects of fungicides on some chemical characteristics of healthy and *Plasmodiophora brassicae* Wor. infected tissues of turnip roots.]** *Mikol. Fitopatol.* 13(5): 393-398; 1979 (13 references).

The effect of the fungicides zineb, colloidal sulfur, benomyl, and daconil (chlorothalonil) on metabolism in healthy turnip roots and in roots infected with *Plasmodiophora brassicae* Wor. was studied. Fungicides (especially zineb) were found to increase the level of dry matter, total sugars, ascorbic acid, and protein nitrogen in infected root tissues; there was a simultaneous decrease in the amount of total nitrogen.

80-3033. Inoue, K. (Kuchinotsu Br., Fruit Tree Res. Stn., Nagasaki 859-25, Japan) **Relationship between dicofol resistance and fitness in the citrus red mite, *Panonychus citri* (McG).** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 165-175; 1980 (20 references).

To analyze the relationship between the dicofol resistance level and fitness in *Panonychus citri*, the reproduction rate, viability and ovoposition rate were compared in dicofol resistant (R) and susceptible (S) strains of the same origin. The reproduction rate in the R strain was lower, especially at higher temperatures (30°C), or under conditions where the feed consisted of greatly damaged leaves of host trees. The lower reproduction rate was mainly the result of lower egg production. Dicofol susceptibility of eggs was measured over 17 generations in a mite population originally composed of equal parts R and S strains. The dicofol susceptibility of the mixed population increased greatly over these 17 generations, possibly indicating that R mites had lower fitness values. Computer simulation was used to analyze the relative value of fitness of the R mites. The experimental value agreed well with the calculated value, for which the relative value of fitness of the R mites was 0.75.

80-3034. Nambu, K.; Ohkawa, H.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Hyogo 665, Japan) **Metabolic fate of phenothrin in plants and soils.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 177-197; 1980 (20 references).

After foliar application of phenothrin isomers to bean and rice plants, the recovery of phenothrin decreased gradually with time. After 30 days, 72-81% of the applied radiocarbon were still recovered from both plants. Most of the radioactivity was present in the leaves, while only 1-3% of the applied chemical was found in the other parts. The edible portions of both plants contained only very small amounts of radioactivity. The ozonides of phenothrin isomers were detected in the treated leaves immediately after treatment and decreased rapidly thereafter. Formylphenothrin was produced in large amounts in both plants shortly after treatment, and decreased only gradually with time. After 30 days' cultivation of bean plants in Kodaira and Katano soils treated with 1.0 ppm ^{14}C-phenothrin isomers, the ^{14}C content in roots was the same as in the soil. Roots cultivated in Muko sand contained several times larger amounts of ^{14}C. The ^{14}C contents of pods and seed were 0.01 and 0.03 ppm, respectively; much lower than in the shoots. Phenothrin isomers were adsorbed tightly to the soil particles, and were scarcely eluted with water. Phenothrin decomposed more rapidly than permethrin when exposed to light, but more slowly than bioresmethrin.

80-3035. Ohkawa, H.; Nambu, K.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chemical Co. Ltd., Takarazuka, Hyogo 665, Japan) **Metabolic fate of fenvalerate (Sumicidin) in bean plants.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 215-223; 1980 (17 references).

Fenvalerate and the [S]-acid isomer was applied to the leaf surface of bean plants at the ratio of 10 μg per leaf. Both compounds disappeared with half-lives of about 14 days. The chemicals underwent decarboxylation, ester cleavage, hydrolysis of the CN group to $CONH_2$ and COOH groups, hydroxylation at 2′- and 4′-phenoxy positions, conversion of the alcohol moiety to 3-phenyloxybenzyl alcohol and 3-phenoxybenzoic acid, and conjugation of the resulting carboxylic acids and alcohols with sugars. Translocation of the chemicals to other parts of the plants occurred only very slightly. Bean plant seedlings were grown for 30 days in Kodaira light clay and Katano sandy loam soils which had been treated with 1.0 ppm fenvalerate. The roots of these plants retained fairly large amounts of the chemical, while the shoots, pods and seeds contained very small amounts of either the parent compound or metabolites. No trace of the parent compound was detected in the shoots.

80-3036. Lipsey, R. L. (Res. & Dev., Kenco Chem. Corp., Jacksonville, FL) **A comparison of pesticide use by Florida PCOs and homeowners.** *Pest Control* 48(10): 26-59; 1980.

Use of pesticides by Florida pest control operators (PCOs) is compared to use by homeowners. PCOs apply about 10^6 pounds (4.5×10^5 kg) of pesticide AI more than homeowners each yr. Agricultural use accounted for 62% and 19% was applied by mosquito control applicators, 7% by PCOs, and 5% by homeowners. Homeowners most frequently used chlordane, carbaryl, malathion, and maneb. PCOs used chlordane, heptachlor, methyl bromide, and chlorpyrifos most frequently. Additionally the survey indicated that homeowners more frequently misused pesticides, including use of highly toxic chemicals and use of stronger than necessary pesticides.

80-3037. Anonymous **Survey of dioxin exposure at Coalite plant.** *Protection* 17(7-8): 39; 1980.

Results of assessment of a survey of 126 2,4,5-T plant workers exposed to dioxin in 1968 are presented. The workers were divided into 3 groups: 31 thought not to have been exposed to dioxin, 54 thought to have been possibly exposed to dioxin, and 41 with dioxin exposure and development of chloracne. General clinical examinations were carried out, along with hematological and biochemical tests and studies of chromosomes and immune capability. No overt diseases (except 2 cases of diabetes) were seen in any workers, and the 3 groups showed no marked differences in their health states. Some biochemical changes occurred in the exposed group. However, the limits of the survey restrict the conclusions which might be drawn.

80-3038. Rose, H.; Rose, H. (Open Univ., Milton Keynes MK7 6AA, England) **2,4,5-T – not all in the mind.** *Trends Biochem. Sci.* 5(9): XV; 1980.

In this letter to the editor the author states his view that damage caused by the spraying of 2,4,5-T in Vietnam is indeed real. He criticizes an earlier report that much of the alleged effects of Agent Orange (2,4,5-T and 2,4-D) have been enlarged due to media exposure. Such effects as chromosomal breakages, persistent chloracne, myasthenia, and teratogenesis have been reported not only from Vietnam spraying, but also from accidents with 2,4,5-T at Dow Chemicals in the US, at Coalite in Britain, and at Seveso, Italy.

80-3039. Donoso, J.; Dorigan, J.; Fuller, B.; Gordon, J.; Kornreich, M. (Mitre Corp., McLean, VA) **Reviews of the environmental effects of pollutants. XIII. Endrin.** *US EPA Rep.* EPA-600/1-79-005: 374 pp.; 1979 (600 references).

A comprehensive, multidisciplinary review of the health and environmental effects of endrin is presented. More than 600 references are cited. Endrin is used chiefly as an insecticide, particularly for the control of lepidopterous larvae that infest cotton crops. In 1971, total US consumption of endrin exceeded 600,000 kg. Endrin is highly toxic to mammals, birds, fish, and insects, but is generally nontoxic to plants. Acute exposure of mammals

to endrin typically results in central nervous disorders, with convulsions leading to death through respiratory failure within two days. Symptoms of acute endrin exposure in humans included convulsions, vomiting, abdominal pain, nausea, dizziness, and headaches. Chronic exposure of mammals to endrin may result in damage to the liver, kidney, heart, brain, lung, adrenal gland, and spleen. Behavioral abnormalities, reproductive disorders, changes in carbohydrate metabolism, changes in blood composition, and other effects secondary to central nervous system disorders have also been observed following chronic exposure of mammals to sublethal doses of endrin. No malignancies attributable to endrin have been reported, but chromosomal abnormalities and teratogenesis have been induced in several mammalian species by endrin. Endrin is dissipated from the environment by photochemical and thermal decomposition and by microbial degradation. Relatively few bacteria can degrade endrin, but many species of algae and fungi exhibit this ability. Environmental contamination by endrin appears to be restricted to areas where the compound is used intensively; background concentrations in the atmosphere, hydrosphere, and lithosphere at locations distant from areas of heavy use are generally below the levels of detection. (Author abstract by permission)

80-3040. Jackson, B. P. (Environ. Res. Lab., Gulf Breeze, FL) **Research review.** *US NTIS PB Rep.* PB-119,878: 77 pp.; 1980.

The report reviews aquatic research programs conducted or managed by the Environmental Research Laboratory, Gulf Breeze, Florida, for the Office of Research and Development, US EPA, in 1978 and 1979. The research program examines the impact of pesticides and other organic compounds on marine species and communities, and seeks to develop new methodology for determining ecological hazards of chemicals under conditions simulating the natural environment. Projects are outlined in the area of exposure assessment, effects assessment, chlorination studies, offshore oil drilling, environmental pathobiology, and the Chesapeake Bay program. (Author abstract by permission)

80-3041. Blackwood, T. R.; Sipes, T. G. (Monsanto Res. Corp., Dayton, OH) **Status assessment of toxic chemicals: hexachlorobenzene.** *US NTIS PB Rep.* PB-146,368: 30 pp.; 1979 (18 references).

The properties, production processes, uses, and emission sources for hexachlorobenzene are explained in this report. The environmental effects, health hazards, and current control technologies are discussed. The problems of the longevity of the hexachlorobenzene molecule and past hexachlorobenzene contamination are discussed and areas requiring further study are pointed out. (Author abstract by permission)

80-3042. Murray, D. S.; Street, J. E.; Soteres, J. K.; Buchanan, G. A. (Dep. Agron., Oklahoma State Univ., Stillwater, OK 74074) **Growth inhibition of cotton *(Gossypium hirsutum)* and soybenan *(Glycine max)* roots and shoots by three dinitroaniline herbicides.** *Weed Sci.* 27(3): 336-342; 1979 (8 references).

Environmental control chamber experiments showed that cotton *(Gossypium hirsutum* L. Stoneville 213) and soybean *[Glycine max* (L.) Merr. Bragg] root and shoot growth were reduced when treated with increasing rates of dinitramine *(N⁴,N⁴*-diethyl- α,α,α-trifluoro- 3,5-dinitrotoluene 2,4-diamine, profluralin *[N*-(cyclopropylmethyl) -α,α,α-trifluoro- 2,6-dinitro *N*-propyl-*p*-toluidine], and trifluralin (α,α,α-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine). Visual root ratings, dry root wt, and fresh and dry herbage wt were used to evaluate plant response to herbicide treatments in environmental chambers. The order of increasing GR_{50} values for cotton on 2 soils and with all response measurements, except dry root wt on 1 soil, was trifluralin, dinitramine, and profluralin. The order of increasing GR_{50} values for soybeans on 2 soils and with all response measurements was dinitramine, trifluralin, and profluralin. (Author abstract by permission)

80-3043. West, I. (Occup. Health Res. & Dev. Stn., Dep. Health Serv., Sacramento, CA) **Toxicity of the herbicide 2,4,5-T.** *West. J. Med.* 131(4): 335-336; 1980.

In this letter to the editor the author supports the decision by the EPA on the emergency suspension of certain applications of 2,4,5-T. It is pointed out that the suspension was not based on the results of the Oregon study alone. Evidence of TCDD contamination in 2,4,5-T at levels greater than expected and of the persistence, teratogenicity and carcinogenicity of TCDD is cited. Delays in the legal proceedings on cancellation of 2,4,5-T use, begun in 1970, are partly due to difficulties in detecting parts per trillion levels of TCDD. It is also noted that the absence of reports on intoxication due to 2,4,5-T in the literature cannot be used to assume 2,4,5-T use patterns are safe. The current suspension, in the opinion of the author, may fall short of providing full protection from 2,4,5-T to the environment and to humans.

80-3044. Meier, D.; Lichtenthaler, H. K.*; Burkard, G. (Bot. Inst., Univ. Karlsruhe, D-7500 Karlsruhe 1, BRD) **Change of chloroplast ultrastructure in radish seedlings under the influenced of the photosystem II-herbicide bentazon.** *Z. Naturforsch. Teil C* 35(7-8): 656-664; 1980 (43 references).

Studies were conducted to determine the effects of bentazon on seedling ultrastructure. Radish seedlings were exposed to the photosystem II herbicide applied to the nutrient medium at concentrations of 10^{-3}, 10^{-4}, and 10^{-6}

M. Segments of the cotyledons were prepared for electron microscopic examination after 1, 3, and 5 days of treatment. The highest concentration induced changes in the grana. Also, the chloroplasts lamellae were enhanced and the chloroplasts themselves were shortened and thickened. These changes are typical of shade adapted chloroplasts.

80-3045. Bergon, M.; Bonafos, M.; Calmon, J. P. (Lab. Chim. Org. Biol. & Biochim. Sol, Ecole Nat. Super. Agron., Inst. Nat. Polytechn., F-31076 Toulouse, France) **Cinetique de la dechloration du barbane em milieu alcalin [Kinetics of barban dechlorination in alkaline medium.]** *Agric. Biol. Chem.* 44(6): 1237-1240; 1980 (9 references) (French).

4-Chloro-2-butynyl *N*-(3-chlorophenyl) carbamate (barban) is an herbicide whose alkaline hydrolysis leads to the release of the chlorine atom of the ester group. The dechlorination kinetics were investigated in alkaline media at 25°C and followed spectrophotometrically or colorimetrically. The rate law of this reaction is complex and shows that the substrate as well as its anion are the reactive species. The p*K*a value determined spectrophotometrically was 13.50. (Author abstract by permission)

80-3046. Williams, D. T.; Denley, H. V.; Lane, D. A. (Environ. Health Dir., Health & Welfare Canada, Ottawa, Ontario K1A OL2, Canada) **On site determination of sulfotepp air levels in a fumigating greenhouse.** *Am. Ind. Hyg. Assoc. J.* 41(9): 647-651; 1980 (3 references).

Sulfotepp air levels in a greenhouse were monitored continuously in real time, for 4-40 hr after fumigation, using a trace atmospheric gas analyzer system. Sulfotepp air levels were below the threshold limit value of 15 ppb following overnight ventilation but, when ventilation was stopped to conserve heat, the sulfotopp air levels exceeded the threshold limit value. This study also showed that worker activity in the greenhouse significantly increased sulfotopp air levels. It is recommended, therefore, that ventilation of a greenhouse following sulfotepp fumigation should continue during the entire day and workers exposed to such conditions should wear appropriate protective equipment. (Author abstract by permission)

80-3047. Rodhe, H.; Soderlund, R.; Ekstedt, J. (Dep. Meteorol., Arrhenius Lab., S-10691 Stockholm, Sweden) **Deposition of airborne pollutants on the Baltic.** *Ambio* 9(3-4): 168-173; 1980 (48 references).

The deposition rates for a number of airborne pollutants affecting the Baltic Sea are calculated. While there are several other sources of pollutants, deposition from the atmosphere is a major source of nitrogen compounds and lead in the Baltic. The physical and chemical processes involved in both wet and dry deposition are described. The substances included in this study are inorganic non-metals, metals, radionuclides, and organic compounds. Methods for calculation of wet deposition of compounds directly from concentrations in rain or snow, and for calculation of dry deposition using deposition velocity values are described. The only organic compounds investigated were PCB and DDT; both deposition and annual flux were calculated. The total (wet and dry) deposition per year was calculated to be 6 tons (range 2-25) for DDT, and 8 tons (range 2-35) for PCB. It is pointed out that with respect to DDT and its metabolites, the Baltic Sea acts as both a sink (sediments, biological matter), and a source (sea spray).

80-3048. Anonymous **The case of Baltic seals.** *Ambio* 9(3-4): 182; 1980 (5 references).

A review is presented of research dealing with the reasons for the rapidly decreasing seal population in the Baltic Sea. Seal hunting is now prohibited, and it is thought that recreational and commercial boating alone could not have such a dramatic effect. Therefore, it is thought that the most likely reason for the decline of the seal is the high level of PCBs in the Baltic seals. A study on ringed seals showed that 27% of females of reproductive age living in a polluted area were pregnant, compared with 80-90% in control areas, suggesting an effect of PCBs on reproduction. The non-pregnant females showed significantly higher levels of both DDT and PCB compared with the pregnant ones. Experiments using minks, another fish-eating species, showed that PCBs, but not DDT, affected the number of whelps born by interrupting pregnancy at an early stage. The conclusion of PCB as the toxic agent is made with some reservation, however, since the effect could be caused by an unknown substance covariating with PCBs. It is pointed out that among the compounds known to be present in Baltic seals are over 130 chlorinated compounds, including DDT, HCB, dieldrin, chlordane, nonachlor, heptachlor epoxide, and oxychlordane.

80-3049. Anonymous **Ocean Pollution.** *Anal. Chem.* 52(7): 749-750; 1980.

The Federal plan for ocean pollution research, development, and monitoring, for fiscal years 1979-1983 is discussed. This plan is intended to provide overall direction and coordination for the federal activities related to ocean pollution research. It is pointed out that analytical chemistry and measurement technology are integrally involved and are frequently the limiting factor in work on ocean pollution problems. The eleven federal agencies involved in this effort are listed, along with a list of the high priority needs which they are addressing. It is noted that of the 65% of federal funding that has been pollutant specific, the major emphasis has been on petroleum (57%), metals and inorganic chemicals (11%), and synthetic organic chemicals (10%). Among the synthetic organics being studied are the halogenated organic compounds used as solvents, pesticides, and polymer intermediates, which include Kepone (chlordecone), DDT, PCBs and dieldrin. The organophosphate pesticides, such as malathion and parathion, which act on the nervous system, are also being studied.

80-3050. Heinz, G. H.; Hill, E. F.; Stickel, W. H.; Stickel, L. F. (Patuxent Wildl. Res. Cent., US Fish &

Wildl. Serv., Laurel, MD 20811) **Environmental contaminant studies by the Patuxent Wildlife Research Center.** *ASTM STP 693* pp. 9-35; 1978 (69 references).

Field and laboratory studies at the Patuxent Wildlife Research Center are geared towards the interpretation of events occurring in nature, especially changes in populations. Strict protocols and routine testing are largely avoided while procedures center around a specific problem. Field work usually consists of monitoring brain or blood cholinesterase levels, looking for disabled or dead animals, evaluating avian nesting success, and gathering other general ecological information. Organochlorine residues are monitored in whole bodies to assess exposure levels, in brain for mortality studies, in eggs for reproductive effects and in whole blood for other specific studies. Simulated field studies are only useful in limited situations, and many ineffective field techniques are also discussed. Some useful experimental tests which aid in predicting and interpreting field results include lethal diagnostic level determinations, comparative lethal diagnostic toxicity tests, secondary poisoning tests, residue loss and blood enzyme measurements, and assessments of reproductive and behavioral effects. [Paper presented at the 1978 ASTM Avian & Mammalian Wildlife Toxicology Symposium]

80-3051. Reid, J. D.; Crabbe, R. S. (Boundary Layer Res. Div., Atmos. Environ. Serv., Downsview, Ontario M3H 5T4, Canada) **Two models of long-range drift of forest pesticide aerial spray.** *Atmos. Environ.* 14(9): 1017-1025; 1980 (21 references).

The long range drift patterns and dry deposition of an aerial application of fenitrothion spray onto a forest was calculated by gradient transfer and Markov chain models to 80 km downwind of the spray line. In order to use the 2 models, it was necessary to assume horizontal homogeneity and neutral stratification with a capping inversion. The initial drop-size distribution is highly polydispersed with a mass mean diameter equivalent to 82 μm. Composition of the droplets is 87.5% water and 12.5% non-volatile fenitrothion. At 80 km, the models showed agreement within a factor of 2.3 on the airborne fraction of fenitrothion, to a few percent on the mode of the spectrum of droplets of 22 μm, and markedly on the largest surviving droplets of 40 μm. Sensitivity was achieved for the assumed source configuration, droplet evaporative characteristics, and initial droplet spectrum.

80-3052. Guadagnino, V.; Borgia, G.; Chirianni, A.; Orlando, R.; Picciotto, L.; Tullio Catoldo, P.; Piazza, M. (Clin. Mal. Infett. II, Fac. Med., Naples, Italy) **Effetto della somministrazione di cardiostenol sulla epatite sperimentale del topo da virus MHV-3. [Effect of cardiostenol administration on MHV-3 virus-induced experimental viral hepatitis of mice.]** *Boll. Soc. Ital. Biol. Sper.* 56(4): 362-368; 1980 (15 references) (Italian).

The etiology of viral hepatitis in drug addicts is highly complex, not only because of the large number of possible virus contact points, but also because of the many possible interactions between virus infection and factors in the addict's environment. The drugs utilized may be deliberately adulterated with a variety of substances, from aspirin to talcum, and may also be unintentionally contaminated in clandestine manufacturing laboratories with various substances including parathion. These substances, as well as the drug itself, may influence the course of hepatitis. The effect of cardiostenol, a pharmaceutical morphine preparation, on mouse viral hepatitis was investigated in the present study, and was found not to differ significantly from the effect of treatment with physiological salt solution.

80-3053. Subba-Rao, R. V.; Alexander, M. (Lab. Soil Microbiol., Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Effect of DDT metabolites on soil respiration and on an aquatic alga.** *Bull. Environ. Contam. Toxicol.* 25(2): 215-220; 1980 (16 references).

Studies of the effect of DDT, DDD (TDE), DDE, 2,2-bis)*p*-chlorophenyl) acetic acid (DDA), DDM, *p,p'*-dichlorobenzhydrol (DBH), *p,p'*-dichlorobenzophenone (DBP), and *p*-chlorophenylacetic acid (PCPA; 4-CPA) on the respiration of microbial components of soil were conducted. No significant effects on microbial respiration were caused by 1, 10, 100 or 1000 μg concentrations of DDM and DBH; by 1, 10, or 100 μg concentrations of DDE, DDD, DDT, and BHE; or by 1 and 10 μg concentrations of DBP/g of soil. PCPA and DDA were toxic, but only at concentrations of 100 μg/g soil. The effect of DDT metabolites on the growth of *Chlorella vulgaris* was also assessed by measuring the rate of synthesis of chlorophyll a. The rate of chlorophyll increase in the *C. vulgaris* culture was not affected by DDD, DDA, DBH or DBP at concentrations of 1 or 10 μg/ml. However, significant increases were noted at a concentration of 1 μg of DDT, DDE, PCPA, BHE or DCBHE/ml. The results of the study suggest that at the lower levels tested, none of the compounds except DCBHE adversely affect either the microbial communities involved in soil respiration or the wide-spread aquatic alga *C. vulgaris*.

80-3054. Tewari, S. N.; Sharma, I. C. (Forensic Sci. Lab., Agra, India) **Study of the distribution of chlorinated organic pesticides in different autopsy materials of human poisoning cases using TLC and UV spectrophotometric techniques.** *Chem. Era* 14(6): 215-218; 1978 (9 references).

A method for estimating chlorinated organic pesticides concentration in autopsy material is presented using UV spectrophotometric techniques. Successful determination of the time of ingestion of the poison can be made by measuring the presence of specific metabolites and

degradation products in the tissues. Chlorinated organic pesticides were extracted from different autopsy tissues and biological materials from poisoning cases by the method described. The accumulation of these pesticides in the tissue and their rate of migration are not similar. High concentrations were found in adipose-storing tissues; only traces were found in blood. High concentrations in the stomach indicated that the victims died within 1-2 hr after ingestion. Similarly, high concentrations in liver indicated death occurred after 2 hr, probably due to slow absorption of the pesticides. Of the 11 cases of endrin poisoning, endrin was present in stomach, intestine, liver, kidney, spleen, heart, lung, blood, and urine. Occasionally endrin was found in other samples. Aldrin was the toxicant in 2 cases and was present only in the stomach fluids in one case and in the other was present only in body tissues. In the 1 case of BHC poisoning, BHC was also only found in body tissues. Organochlorine concentrations ranged from 0.24 mg/100 g tissue to 66.00 mg/100 g tissue.

80-3055. Hinchcliffe, P. R. (Author address not given) **The UK approach to monitoring river and tidal water quality.** *Chem. Ind. (London)* 15: 603-609; 1980 (22 references).

Various programs used in England to monitor the contaminants in river and tidal waters are described. Surveys of river pollutants were conducted in England in 1970 and 1975, and it is planned that the same type of survey be repeated every 5 yr. These surveys provide an instantaneous picture in very general terms of water quality throughout the country's river system. The Harmonized Monitoring Scheme was developed to complement this information by providing detailed time-series data on about 75 determinants at key points on the river system. The determinants measured include aldrin, BHC, heptachlor, *p,p'*-DDE, dieldrin, *p,p'*-TDE and PCBs. Results from the Harmonized Monitoring Scheme are sent to the Department of the Environment's Water Data Unit. After validation they are stored for subsequent retrieval. The Marine Pollution Monitoring Management Group coordinates national monitoring programs in tidal waters. Future expected developments in monitoring pollution in England's waterways are discussed briefly.

80-3056. Ebing, W.; Schuphan, I. (Biol. Bundesanstalt Land Forstwirtsch., Inst. Pflanzenschutzmittelforsch., D-1000 Berlin, BRD) **Studies on the behavior of environmental chemicals in plants and soil quantitatively investigated in closed cultivating systems.** *Ecotoxicol. Environ. Saf.* 3(2): 133-143; 1979 (3 references).

The fate of soil-applied ^{14}C-monolinuron in plants was studied in closed cultivation systems which allowed for collection of volatile pesticide metabolites. One application corresponding to 1.36 kg Aresin (monolinuron)/ha was applied to the soil followed by a cultivation sequence of spinach, cress, and potatoes. Quantitative measurements of all radioactivity yielded a 96% overall recovery. Spinach contained 4.1% of the applied radioactivity, cress 5.6% old potatoes and leaves 9.5%, new tubers 1%, soil 68.6% and liberated CO 5.3%. ^{14}C-Hydroxy-monolinuron β-glucoside was injected into the stems of spinach plants (543.1 mg/kg plant dry wt). Plants grown for 26 days in the closed cultivation system yielded a 96.6% recovery of applied radioactivity. Applications of ^{14}C-buturon to winter wheat gave 89.1% recoveries of the applied radioactivity after 155 days. After 195 days, 98.8% of a preemergence dose of ^{14}C-diallate was recoverable from sugar beets. When labeled triallate was applied to sugar beets in a similar experiment, only 78.4% of the initial radioactivity was recoverable. This low recovery of radioactivity was attributed to large amounts of unmetabolized triallate in soil and leaves of the beet plants. A ^{14}C-dichlofluanid fungicide was applied twice to strawberry plants and yielded an overall recovery of 98.9% after 36 days. Disinfection studies using ^{14}C-captan on soil sown with spinach gave 87.1% recovery of radioactivity after 36 days. Experiments were also conducted using labeled captan or dichlofluanid on stored apples under aerated or closed conditions in the cultivation apparatus.

80-3057. Douthwaite, R. J. (Cent. Overseas Pest Res., Coll. House, London W8 5SJ, England) **Occurrence of birds in *Acacia* woodland in Northern Botswana related to endosulfan sprayed for tsetse fly control.** *Environ. Pollut.* 22(4): 273-279; 1980 (4 references).

During a spray program for control of the tsetse fly *Glossina morsitans* in *Acacia* woodlands of northern Botswana, the populations of bird species were monitored. Endosulfan was sprayed sequentially as an ultra-low volume aerosol at levels of 6-12 g/ha. No significant decline in any bird species was noted during the spraying period. Bird species diversity studies showed increases along 2 sprayed and 2 unsprayed transects during the spraying season. No differences were observed in the changes of occurrence of insectivorous species along the sprayed and the unsprayed transects. These findings support the preferability of several light applications of endosulfan over one single heavy application for insect control to protect surrounding wildlife.

80-3058. Kuehl, D. W.; Dougherty, R. C. (Dep. Chem., Florida State Univ., Tallahassee, FL 32306) **Pentachlorophenol in the environment. Evidence for its origin from commercial pentachlorophenol by negative chemical ionization mass spectrometry.** *Environ. Sci. Technol.* 14(4): 447-449; 1980 (15 references).

Commercial pentachlorophenol (PCP) contains significant quantities of tetrachlorophenol (TCP). The occurrence of TCP in environmental samples provides a chemical marker for PCP originating from commercial

formulations. Negative chemical ionization mass spectrometry has been used to examine a commercial PCP formulation and a series of environmental and human samples. Tetrachlorophenol was determined by the ion current at *m/z* 229, tetrachlorphenoxide, and PCP was determined by the ion current at *m/z* 267, pentachlorophenoxide. The ion current at *m/z* may include contributions from the oxygen/chloride exchange product of hexachlorobenzene, an environmental precursor of PCP. The ratio of PCP to TCP in Dowicide G-ST, a commercial PCP formulation, was 2.5 ± 0.1. The ratio of *m/z* 267 to *m/z* 229 in a jellyfish, *Mnemiopsis macrydi*, from the Gulf of Mexico was 2.7 ± 0.1; in human semen it was 4.1 ± 0.1; and in human adipose tissue it was 15.5 ± 0.1. PCP in the semen samples was concentrated in the sperm cells by a factor of 9. (Author abstract reprinted by permission of the American Chemical Society)

80-3059. Gile, J. D.; Collins, J. C.; Gillett, J. W. (Terrestrial Div., Corvallis Environ. Res. Lab., US EPA, Corvallis, OR 97330) **Fate of selected herbicides in a terrestrial laboratory microcosm.** *Environ. Sci. Technol.* 14(9): 1124-1128; 1980 (11 references).

Four ^{14}C-labeled herbicides (simazine, bromacil, trifluralin, and 2,4,5-T) were applied as a foliar spray at 0.28 kg/ha in a terrestrial microcosm chamber (TMC) to examine their transport and metabolism in comparison to dieldrin. The TMC was made up of a synthetic soil, red alder and Douglas fir seedlings, rye grass, a gravid gray-tailed vole *(Microtus canicaudus)*, and numerous invertebrates. Total herbicidal residues in soil averaged 0.14 ppm for all compounds by 20 days posttreatment. Very little of the parent compound was found in the soil for the 4 herbicides tested. Radioactivity in rye grass shoots ranged from an average of 2.5 ppm for 2,4,5-T to 16.8 ppm for simazine. The most rapidly decomposed herbicides were trifluralin and 2,4,5-T with the latter being mostly in the form of extractable metabolites. A greater accumulation of ^{14}C material by invertebrates was observed with dieldrin than with any of the herbicides. ^{14}C-Residues in the vole for dieldrin and simazine were about twice those found for the other compounds. No trace of any of the compounds tested was present in samples of ground water from the TMC.

80-3060. Pfannhauser, W.; Scheidl, I.; Woidich, H. (Forschunginst. Ernaehrungswirtsch., Vienna, Austria) **Untersuchungen ueber den Pestizidgehalt in Nahrungsmittelfetten und -oelen. [Examination of the pesticide content of nutritional fats and oils.]** *Fette Seifen Anstrichm.* 82(6): 232-233; 1980 (11 references) (German).

Organochlorine pesticide residue levels were determined in dietary fats and oils of vegetable and animal origins. The hexachlorobenzene (HCB) levels were 0.005-0.072 ppm in animal fats and palm fat, 0.054 ppm in pumpkinseed oil, and undetectable in other vegetable fats and oils. The α-BHC + β-BHC levels were 0.002-0.021 ppm, and undetectable in coconut fat. The lindane level averaged 0.001-0.056 ppm in the vegetable and animal fats and oils. The aldrin + dieldrin levels were 0.001-0.025 ppm. The Σ DDT level was 0.005-0.687 ppm, but it was undetectable in coconut fat. The PCB levels were 0.096-0.19 ppm in animal fats and oils, and 0.93-24 ppm in fish oil extracted from fish. Refining reduced the α-BHC + β-BHC level in sunflower seed oil by 98%, the lindane level by 90% and the total DDT level by 55%.

80-3061. Kosachevskaya, P. I. (Dep. Munic. Hyg., Kiev Inst. Adv. Med., Kiev, USSR) **Gigienicheskaya otsenka vody, zagryaznennoi nekotorymi pestitsidami pri postuplenii ikh v vodoem s poverkhnostnym. [Hygienic evaluation of water polluted by pesticides entering water bodies in surface runoff.]** *Gig. Sanit.* 45(6): 8-11; 1980 (3 references) (Russian).

Biochemical oxidation processes in water are activated to a greater extent when Chloramp and Banvel-D (dicamba) are present together in a pesticidal formulation than when each is present as a separate pollutant at the same levels. When mixtures of these compounds enter a water body at levels near the organoleptic threshold, biochemical oxidation processes will cause reduced concentrations of dissolved oxygen and increased unsanitary conditions. When plants are treated simultaneously with effective applications of 0.3 and 5 kg/ha of Chloramp and Banvel-D, respectively, a hazard exists that nearby water bodies will be contaminated if the pesticide residues enter surface runoff waters.

80-3062. Kuyumdzhieva, T. I.; L'ochev, Ib. S. (Inst. Hyg. & Occup. Dis., Sofia, Bulgaria) **O gigienicheskom normirovanii gerbitsida Treflan v pochve. [Hygienic standardization of the herbicide Treflan in soil.]** *Gig. Sanit.* 45(7): 62-63; 1980 (3 references) (Russian).

The rate of degradation of the herbicide Treflan (2,6-dinitro-4-trifluoromethyl- *N,N*-dipropylaniline; trifluralin) in soil was studied. It was found that more than 95% of applied Treflan is accumulated in the top soil layer; 60-75% of Treflan broke down within the first 3 mo of application. Treflan in concentrations exceeding permissible levels had phytotoxic effects. It is recommended that 1.0 mg/kg should be adopted as a maximum permissible concentration of Treflan.

80-3063. Dubenetskaya, M. M.; Patent, R. L.; Voitik, N. P.; Bogan, A. S.; Enshina, A. N.; Karaseva, A. E. (Byelorussian Res. Sanit. Hyg. Inst., Minsk, USSR) **O vliyanii gerbitsida Semerona na nekotorye pokazateli pishchevoi tsennosti i bezvrediosti kapusty. [Effect of the herbicide Semeron on some indices of nutritional value and**

harmlessness to cabbage.] *Gig. Sanit.* 45(7): 76; 1980 (1 reference) (Russian).

The effect of the herbicide Semeron (2-methylthio-4- methylamino-6-isopropylamino- *symm*-triazine; desmetryne) on the nutritional value of cabbage was studied. Herbicide was incorporated into the soil at 0.7 kg/ha 2 wk after cabbage planting. Residual amounts of the herbicide, the level of dry substances, ascorbic acid and ascorbinase were studied by thin layer chromatography. It was found that cabbage samples did not contain Semeron residues. Herbicide administration did not change the organoleptic properties of cabbage, but increased the level of ascorbic acid. Feeding rabbits with the treated cabbage did not result in any visible or biochemical changes in the test animals.

80-3064. Pai, S. B.; Vasatharajan, V. N. (Microbiol. & Cell Biol. Lab., Indian Inst. Sci., Bangalore 560012, India) **Isolation and characterization of an organophosphorus pesticide-degrading phosphatase from *Alcaligenes* NC$_5$.** *Indian J. Biochem. Biophys.* 16(1): 20; 1979.

A phosphatase was isolated and characterized from a bacterium, *Alcaligenes* NC5. This phosphatase is hydrolytically able to cleave a number of organophosphorus pesticides. The enzyme activity was maximal at 12 hr after induction and at a concentration of $3.6 \times 10^{-3} M$. The enzyme localized in the periplasmic region of the bacterium and was purified to homogeneity by osmotic shock, Sephadex gel filtration and DEAE-cellulose column chromatographic methods.

80-3065. Fernandez, J.; Franco, J. M. (Inst. Invest. Pesq., Vigo, Spain) **Residuos de hidrocarburos clorados en el jurel *(Trachurus trachurus)* y en la bacaladilla *(Micromesistius poutassous)* de la costa gallega. Su relacion con el contenido lipidico. [Residues of chlorinated hydrocarbons in horse mackerel *(Trachurus trachurus)* and blue whiting *(Micromesistius poutassou)* from the Galician coast. Relation to lipid content.]** *Invest. Pesq.* 43(2): 491-500; 1979 (9 references) (Spanish).

Fish species were collected off the Galician coast. DDT and PCB levels were determined and were correlated to the lipid content. Dorsal muscle and viscera extractable organic matter (EOM) were used as an indicator of the lipid content. Organochlorine residues were also determined on a wet wt basis. In mackerel ΣDDT levels ranged from 12.7 ng/g to 141.6 ng/g on a wet wt basis. ΣDDT levels from EOM in mackerel ranged from 0.3 μg/g to 5.7 μg/g. In blue whiting wet wt ΣDDT levels were trace-450.0 ng/g and EOM ΣDDT levels were trace-16.7 μg/g. A correlation between total organochlorine levels and lipid content was established for the mackerel, but in the whiting this relationship was not significant.

80-3066. Oller, W. L.; Gough, B.; Littlefield, N. A. (Natl. Cent. Toxicol. Res., FDA, US Dep. HEW, Jefferson, AR 72079) **Chemical surveillance and quality assurance for preparation of dosed (2-AAF) animal feed (ED_{01} study).** *J. Environ. Pathol. Toxicol.* 3(3): 203-210; 1980 (25 references).

This paper reviews the development of the ED_{01} experiment which was used for chemical surveillance and quality control of prepared animal feeds. Controls were developed for both the laboratory and administrative levels to assure that proper feed packaging and delivery were carried out. A plan for employee surveillance as well as a chemical surveillance of the work areas was delineated to ensure safety. Prior to use, monitoring of animal feed and ancillary animal supplies was carried out. This latter procedure was intended to ensure that the acceptable levels of nutrients were present and that unacceptable levels of contaminants such as pesticides and heavy metals were not present. Pesticide (organochlorines and organophosphates) levels detected in wood chips, cardboard feeder boxes and animal feed are presented in tabular form.

80-3067. Albright, L. J.; Oloffs, P. C.; Szeto, S. Y. (Dep. Biol. Sci., Simon Fraser Univ., Burnaby, British Columbia V5A 1S6, Canada) **Residues in cutthroat trout *(Salmo clarki)* and California newts *(Tarichia torosa)* from a lake treated with technical chlordane.** *J. Environ. Sci. Health B* 15(4): 333-349; 1980 (13 references).

Following the spraying of lake water with 10 ppb chlordane, cutthroat trout and newts were analyzed for pesticide residues. Tissue analysis was performed by gas-liquid chromatography. Newts accumulated high levels of chlordane within 14 days of treatment. Levels as high as 1285 ppb α-chlordane and 1132 ppb γ-chlordane were measured after 14 days. After 45 days, 35-327 ppb α-chlordane and 13-144 ppb γ-chlordane was measured in the newts. After 3 yr no chlordane was detected. Chlordane ranged from 1193 ppb to 34,094 ppb after 14 days, but was reduced considerably after 45 days. The decline of chlordane in trout bodies was similar to that of newts. In both species, *trans*-nonachlor was the most persistent constituent, accounting for 49-55% of total. The major difference between the metabolism of chlordane by these 2 species is that heptachlor was epoxidized in newts after 14 days, but was still present in trout after 93 days.

80-3068. Sundaram, K. M. S.; Szeto, S.; Hindle, R.; MacTavish, D. (For. Pest Manage. Inst., For. Serv., Environ. Canada, Sault Ste. Marie, Ontario P6A 5M7, Canada) **Residues of nonylphenol in spruce foliage, forest soil, stream water and sediment after its aerial application.** *J. Environ. Sci. Health B* 15(4): 403-419; 1980 (9 references).

Studies were performed to determine the fate of nonylphenol (a component of aminocarb) after spraying a

mixed coniferous forest. The pesticide was applied at 0.47 l/ha. After application samples of spruce foliage, forest soil, stream water and sediment were taken 1, 3, 4, 6 and 24 hr, and 2, 3, 4, 5, 9, 14, 30 and 62 days post treatment. Samples were analyzed by high performance liquid chromatography. Residues in white spruce were 18.9 ppm 1 hr after spraying and decreased to 4.86 ppm in 4 hr, 0.54 ppm in 30 days, and were not detected after 62 days. The pesticide was detected at trace levels after 4 hr but was not detected at any other time in the sediments. After 1 hr 9 ppb were detected in the water, but decreased to 50% in 2 hr. After 5 days no residue was detected. No residues were detected at any time in the soil samples. It is suggested that if used at allowable levels this pesticide is quite non-persistent.

80-3069. Venkateswarlu, K.; Chendrayan, K.; Sethunathan, N. (Cent. Rice Res. Inst., Cuttack 753006, India) **Persistence and biodegradation of carbaryl in soils.** *J. Environ. Sci. Health B* 15(4): 421-429; 1980 (9 references).

Studies were designed to determine the relative persistence of carbaryl in flooded and nonflooded soil systems, and its degradation by a bacterium. The soils used were alluvial, laterite, and 2 acid sulfate saline (pokkali and kari). Twenty gram portions of each soil were treated with 1 mg of technical grade carbaryl, then flooded with distilled water and incubated at room temperature. In a second experiment, carbaryl persistence was compared in alluvial and pokkali soils under flooded and nonflooded conditions. At various intervals, residues were separated by thin-layer chromatography and analyzed spectrophotometrically. Under flooded conditions, the carbaryl concentrations decreased with incubation in all soils, but a substantial portion (37, 46, 45 and 75%) of the insecticide was recovered from alluvial, laterite, pokkali and kari soils even after 15 days. Carbaryl exhibited half-lives of 10, 14, 12 and 31 days in the alluvial, laterite, pokkali and kari soils, respectively. Carbaryl decreased more rapidly under flooded, compared to nonflooded, conditions. In another experiment, a bacterium, *Pseudomonas cepacia*, isolated from carbofuran-amended flooded alluvial soil by enrichment culture technique was found to degrade carbaryl in a mineral medium supplemented with yeast extract.

80-3070. Chopra, S. L.; Bhardwaj, S. S.; Handa, R. (Dep. Chem., Punjab Agric. Univ., Ludhiana, India) **Adsorption of isolan (1-isopropyl-3-methyl- 5-pyrazolyl dimethyl carbamate) by some clay minerals.** *J. Indian Chem. Soc.* 56(1): 90-95; 1979 (13 references).

The adsorption of isolan by sodium saturated samples of pyrophyllite, hectorial hector, fuller's earth, kaolinite, illite, bentonite (Na) and montmorillonite clays was studied at 15 or 25°C. Adsorption of isolan increased with increasing concentrations with an order of adsorption of montmorillonite > bentonite (Na) > illite > kaolinite > fuller's earth > hectorial hector > pyrophyllite. Adsorption isotherms of isolan on clay minerals are of S-shape and adsorption of isolan decreased with increasing temperature suggesting the involvement of van der Waal forces. Stronger bonding of the insecticide to bentonite (Na) and montmorillonite was noted in the higher K values for these soils. The partial molar free energy value was at its maximum for montmorillonite. Isolan desorption from the clays with an aqueous solution of surfactant resulted in the least amount of insecticide being desorbed from montmorillonite indicating the strong binding of isolan to this clay mineral due to its expanding nature.

80-3071. Anonymous **Diet.** In: *Malignant Neglect.* Highland, J. H. et al., eds. (Alfred A. Knopf Inc.: New York): CH07: 137-153; 1979.

A discussion of carcinogenic substances in food is presented. It is noted that food may contain residues of contaminants that have entered the food in nature or during processing, packaging or storage, along with residues of pesticides applied to crops under cultivation. Three regulatory agencies involved in the control of pesticide residues in food are the US EPA, the USDA and the FDA. It is suggested that the public is still not adequately protected due to the fact that many tolerance levels are set without adequate evidence of safety. The situation is also complicated by the fact that detection capability is deficient. The FDA is incapable of detecting 62% of the insecticides, 87.5% of the herbicides, 85% of the fungicides, and 86% of the other pesticides known to leave residues in food. It is concluded that some of the data supporting existing tolerances are unreliable.

80-3072. Hernandez, C.; Strassman-Sundy, S. (Author address not given) **Pentachlorophenol in log homes – Kentucky.** *Morbid. & Mortal. Wkly. Rpt.* 29(36): 431-432, 437; 1980 (7 references).

Five members of a family living in a log home in Louisville, Kentucky were found to have serum PCP in the range of 580-1750 ppb and urinary PCP levels of 47-216 ppb. The highest levels were found in the family's 2-yr-old and 4-yr-old daughters. Levels exceeded the PCP contents determined in 42 control subjects 7-fold. PCP concentrations of 0.20 $\mu g/m^3$ and 0.38 $\mu g/m^3$ were determined respectively in air samples collected on the first and second floors of the 2-story house. The interior surface wood had been dipped in a 5% solution of PCP in 1975. A sample of this wood was analyzed and found to contain 0.11% PCP. Retesting of 3 members of this family and testing of an additional 29 residents of log homes treated with PCP confirmed the elevated PCP levels. Residents of log homes without PCP treatments had PCP levels comparable to controls. None of the log home residents reported health problems or symptoms as a result of living in these homes.

Vaporization of PCP from treated walls can be reduced substantially by coating interior log walls with a sealer such as polyurethane.

80-3073. Nose, K. (Natl. Inst. Agric. Sci., Yatabae, Tsukuba-gun, Ibaragi 305, Japan) **[A method for estimating leaching property of pesticides.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 199-205; 1980 (8 references) (Japanese).

Changes in concentration of eluate for a soil column system in which pesticide solution was added at constant concentrations were investigated and found to follow a polynomial expression. The polynomial was composed of a theoretical plate number P of the soil column, adsorption ratio G for the soil, and distance moved by the solution, expressed by imaginary plate number n. An inflexion point occurs in the curve except when G is small or P is unity. A constant value of about 12 g as the soil weight per unit plate was obtained with picric acid using soil columns with different weights of a volcanic ash soil. No adsorption on the soil was noted with chlorate, and no physically significant P value was calculated. A small G value was obtained from pentachlorobenzoic acid, which indicated that the amount of soil used in the assay was too small to allow any physically significant P value to be calculated. An apparatus to supply a constant flow rate of water was devised for use in this study.

80-3074. Akabane, T. (Natl. Inst. Agric. Sci., Nishigahara, Kita-ku, Tokyo 114, Japan) **[Leaching of dichromate, phosphate, phosphate esters, and nitrobenzenes in soil.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 207-213; 1980 (7 references) (Japanese).

Determination was made of the theoretical plate number of soil columns for elution of several chemicals from samples of Nishigahara volcanic ash soil. The leaching curve for dichromate showed a very slow rise in the early stage followed by a more rapid rise later on. A slow rise and no plateau on the leaching curve was demonstrated for phosphate. These findings indicate that the soil may become saturated with these chemicals before giving a normal leaching curve. An unusual adsorption ratio was noted with dimethyl hydrogen phosphate, which showed a tendency to increase with an increase in the amount of solute employed. These three chemicals did not provide any physically significant plate numbers. Adsorption of dimethoate was too small. Trichlorfon showed a normal leaching curve, but the plateau was low, implying loss during the leaching test. The soil wt per unit plate was 12 g for elution of trichlorfon. Normal leaching curves were obtained for *p*-nitrophenol, *p*-nitrobenzaldehyde and *p*-nitroanisole, and the soil wt per unit plate was 4-6 g.

80-3075. Mikami, N.; Takahashi, N.; Miyamoto, J.; Hayashi, K. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo 665, Japan) **Photodegradation of fenvalerate (Sumicidin) in water and on soil surface.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 225-236; 1980 (30 references).

Degradation rates and pathways were studied for fenvalerate in distilled water, 2% aqueous acetone, river and sea water, and on three types of soil under natural sunlight. In each aqueous suspension the half-life of fenvalerate ranged from about 4 days in summer to 13-15 days in winter; the difference were caused by changes in the intensity of the sunlight. On soil surfaces, photodegradation rates were dependent on the type of soil used. In Kodaira light clay the half-life was about 2 days. In Azuchi sandy clay loam and Katano sandy loam soils the half life was 6 and 18 days, respectively. In the absence of sunlight about 55 to 83% of the applied fenvalerate remained on the soils 20 days after initial treatment. Photodecomposition was accomplished through oxidation, decarboxylation, hydration of the CN group to $CONH_2$, cleavage of the ester or diphenyl ether linkage, and hydrolysis from $CONH_2$ to COOH. In water, hydrogen cyanide was liberated and quickly converted to carbon dioxide by the sunlight. On soils, hydration at CN was the dominant reaction. In water the predominant reactions were decarboxylation and cleavage of ester linkages.

80-3076. Uchida, M.; Kanauchi, M.; Hashimoto, K. (Biol. Res. Cent., Nihon Nohyaku Co. Ltd., Osaka 586, Japan) **Adsorption and mobility of isoprothiolane in soils.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 249-254; 1980 (14 references).

Adsorption isotherms of isoprothiolane on several soil types were approximately straight lines. This indicates that soil adsorption of isoprothiolane from water is categorized into Henry's type, in which adsorbents have excess sites for adsorbates. The mobility of isoprothiolane in the soils varied inversely with their adsorptive capacity, and there was a good correlation between the logarithmic values of mobility and the adsorption constant of isoprothiolane. Leaching was slow in soils with strong adsorption capacity. When no leaching occurred, more than 80% of the applied isoprothiolane was localized within 2 cm of the soil surface. The uptake of isoprothiolane by rice plants was suppressed in the presence of soil. The amounts taken up corresponded to the remaining concentration of isoprothiolane in water estimated from the adsorption constants. It is suggested that the reversible adsorption by soils may act as a reservoir for the pesticide so that plants continue to take up and translocate the pesticide over long periods of time.

80-3077. Ishikawa, K. (Life Sci. Res. Inst., Kumiai Chem. Ind. Co. Ltd., Shizuoka 439, Japan) **[Studies on the fate and behaviors of benthiocarb herbicide in biota and**

the environment.] *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 287-293; 1980 (23 references) (Japanese).

Mites, plants, soils and river water were used to study the fate and behavior of benthiocarb. The chemical was rapidly absorbed from the gastrointestinal tract of mice, metabolized, and excreted with the urine. Rice plants and barnyard grass absorbed benthiocarb through their roots and rapidly metabolized the herbicide. Degradation in soil was faster under aerobic conditions than under anaerobic conditions. Photochemical decomposition was rapid. Major degradation pathways occurred through deethylation, hydrolysis and oxidation. While the major pathways were the same for different biota and under light, the main metabolites produced were different. Benthiocarb was rapidly volatilized from aqueous solution. The rate of volatilization decreased markedly when soil was added to the solution. The chemical did not volatilize quickly from soil which had not been flooded. The amount of benthiocarb in water, soil and crops decreased rapidly over time. Only small residual amounts were found in cereals, vegetables and other tested crops.

80-3078. Bozzay, J.; Rusznak, I.; Varga, I. (Dep. Org. Chem. Technol., Tech. Univ. Budapest, H-1521 Budapest, Hungary) **Model studies on the adsorption of pesticides on humic acid.** *Period. Polytech. Chem. Eng.* 23(2): 99-107; 1979 (16 references).

Adsorption of pesticides, pesticide precursors and surfactants onto humic acid and the factors which affect it were examined. Phenylureas, trichlorophenoxy derivatives, and *m*-dinitrophenol derivatives were tested in aqueous solutions with or without the addition of a surfactant. It was found that the adsorption and bonding force of a compound depended on the physicochemical nature and steric requirements of the substrate and on the quality of its functional groups. Adsorption of pesticides in the presence of a surfactant was observed to decrease sharply around the critical micellar concentration of the surfactant. This effect was attributed to the solubilization of the pesticide by the micelles.

80-3079. Visalakshi, A.; Nair, M. R.; Aiyer, R. S. (Coll. Agric., Trivandrum, India) **Effect of phorate on mineralization of nitrogen in a red soil.** *Pesticides* 13(3): 21-23; 1979 (8 references).

The mineralization of nitrogen was measured each wk for 9 wk in samples of red soil treated 3 times with 0, 1, 2 or 3 kg phorate/ha. Ammoniacal, nitrate and nitrite nitrogen were determined immediately after sieving of soil samples. Phorate application at doses of 2 and 3 kg AI/ha increased ammoniacal nitrogen content by 40.25 and 40.87%, respectively. Nitrate nitrogen formation in soil was increased by 38.0, 5.25, and 11.58% by phorate doses of 1, 2, and 3 kg AI/ha, respectively. No significant changes were noted in the nitrite-nitrogen formation due to the application of phorate.

80-3080. Bopaiah, B. M.; Rai, P. V. (Dep. Microbiol., Univ. Agric. Sci., Hebbal, Bangalore 560024, India) **Effect of four common herbicides on the population of microorganisms in red sandy soil.** *Plant Soil* 52(3): 451-452; 1979 (8 references).

Red sandy soil samples were exposed to treatment with Lasso (alachlor), nitrofen, propinol (propanil) or simazine. Nitrofen showed adverse effects on bacterial and actinomycetes populations. Propinol and Lasso decreased the bacterial population only. No adverse effect on *Azotobacter* population was noted. Lasso, nitrofen and simazine treated soils demonstrated an increase in *Azotobacter* population. Fungal population was also stimulated by simazine and Lasso. In general the application of these herbicides did not cause great changes in the total number of microorganisms present in the soil.

80-3081. Ray, R. C.; Ramakrishna, C.; Sethunathan, N. (Lab. Soil Microbiol., Cent. Rice Res. Inst., Cuttack 753006, India) **Nitrification inhibition in a flooded soil by hexachlorocyclohexane and carbofuran.** *Plant Soil* 56(1): 165-168; 1980 (15 references).

Studies were performed to determine the effects of 2 chlorinated hydrocarbon insecticides on nitrification in soils. Samples of alluvial soil were placed in 250 ml flasks and covered with 20 ml distilled water. Hexachlorocyclohexane (HCH; BHC) was added at rates of 10 and 100 ppm. Carbofuran was added to other flasks at a rate of 500 ppm. Studies on combinations of both pesticides were performed by adding both carbofuran at 500 ppm and HCH at 5 ppm to the same flask. After incubation, nitrifying bacteria numbers were estimated and NH_4 and NO_3 were assayed. Ammonia oxidation was inhibited significantly at 10 ppm and almost completely inhibited at 100 ppm HCH. The numbers of bacteria decreased accordingly. Addition of 500 ppm carbofuran did not affect nitrification. However, the synergistic effect of both pesticides was a decrease of nitrification by 71% at the end of 40 days. It is suggested that these studies are important because of the increased use of several pesticides simultaneously.

80-3082. Sheldon, A. W. (M&T Chem. Inc., Rahway, NJ) **Dissipation and detoxification of organotins in the environment.** *Proc. Annu. Mar. Coat. Conf.* 18: 1-18; 1978.

The dissipation of 3 commonly used organotins in soil environments was studied. These test materials were: tributyltin oxide (TBTO), tributyltin fluoride (TBTF), and triphenyltin fluoride (TPhTF). The soil employed in these studies was sandy loam obtained from South Carolina. Soil samples were treated with about 2.5 ppm of 1 of the 3 test compounds. After 182 days all 3 test compounds showed substantial degradation, especially in those samples kept under aerobic conditions. Degradation under anaerobic

conditions was not as consistent as that under aerobic conditions. In the aerobic tests the TPhTF had released 37.2% of the applied radioactivity as CO_2; the TBTF had evolved 11.6% and the TBTP, 14.2%. It is suggested from these studies that the organotins used in antifouling coatings are not persistent pesticides and do not present the hazards usually associated with persistent materials.

80-3083. Kesterton, M. S.; Hayes, M. H. B. (Lenton Res. Stn., Boots Co. Ltd., Nottingham NG7 2QD, England) **Some studies of soil bound residues.** *Proc. Br. Crop Prot. Counc.* 14(2): 573-580; 1978 (22 references).

This review discusses the binding of pesticide residues in the soil and the various factors which influence this binding. Specific attention is given to the binding of pesticide residues by soil organic colloids, binding mechanisms and methods used to study them, and binding by the soil clay-size fraction. Data are presented for the incorporation of labeled residues of ethirimol in the clay-sized components of 3 types of English soils.

80-3084. Falandysz, J.; Michalska, B.; Trojanowska, J.; Wodecka, S. (Prov. Sanit. Epidemiol. Stn., Gdansk, Poland) **Pozostalosci chlorowanych weglowodorow aromatycznych w watrobie dorsza baltyckiego i jej przetworah. [Residues of chlorinated aromatic hydrocarbons in the liver of the Baltic cod and in canned cod liver products.]** *Rocz. Panstw. Zakl. Hig.* 31(2): 163-168; 1980 (14 references) (Polish).

Livers of the Baltic cod, caught at various Polish fishing locations, all contained DDT (ΣDDT average 7.2 mg/kg; range 0.26-33 mg/kg). PCBs were present in some samples, especially those caught near the Swedish coast, at an average level of 8.8 mg/kg and a maximum of 13 mg/kg. A smaller number of samples contained HCB, with an average of 2.8 mg/kg and a maximum of 0.28 mg/kg. Residues in canned products such as cod liver in its own fat and Caucasian style fish liver were slightly below the residues in fresh liver, and in other products such as cod liver pie, they were about half of the fresh fish values.

80-3085. Couillard, D. (Inst. Natl. Rech. Sci. (INRS-Eau), Univ. Quebec, Sainte-Foy, Quebec G1V 4C7, Canada) **Evaluation de la pollution et des repercussions des rejets des industries des pates et papiers sur la vie aquatique. [Evaluation of pollution and impact of pulp and paper industry wastes on aquatic organisms.]** *Sci. Total Environ.* 14(2): 167-184; 1980 (36 references) (French).

Various changes which occur in the aquatic environment due to contamination with effluents from the pulp and paper industry are described. Among the toxic chemicals found in the effluent is the pesticide PCP. Global consequences of such contamination are considered. Specific effects on sedimentation, photosynthesis, and on the availability of dissolved oxygen are discussed. Damage to fish is detailed along with information on the toxicity potentials of resinous acids and their derivatives, fatty acids, and sulfurus derivatives. Some discussion is also given to the problems of foul taste and odor caused by these pollutants.

80-3086. Frank, R.; Sirons, G. J. (Prov. Pestic. Residue Test. Lab., Ontario Min. Agric. & Food, Guelph, Ontario N1G 2W1, Canada) **Chlorophenoxy and chlorobenzoic acid herbicides; their use in eleven agricultural watersheds and their loss to stream waters in southern Ontario, Canada 1975-1977.** *Sci. Total Environ.* 15(2): 149-167; 1980 (22 references).

A survey of pesticide usage in 11 watersheds was conducted to select suitable streams for water analysis. The survey indicated that chlorophenoxy and chlorobenzoic acid herbicides were used extensively for weed control in a large variety of agricultural and non-agricultural conditions. Stream monitoring was conducted by collecting water samples reflecting storm runoff and base flow conditions. Rainwater and stream bed sediment samples were also collected. The analyses showed that levels of 2,4,5-T ranged from not detectable (ND) to 1.1 μg/l, with a mean of < 0.1 μg/l. MCPA ranged from ND to 0.3 μg/l, with a mean of < 0.1 μg/l. Dicamba was detected in only 2 streams, and the mean levels were < 0.1 μg/l. 2,4-D ranged from ND to 32.0 μg/l. Losses of these pesticides to streams were related to spray activity in the watersheds. Losses to streams were 0.03% and 0.5% of agricultural and nonagricultural uses. The concentrations of these compounds in the streams studied were below the accepted water quality standards and were suggested to pose no known hazard.

80-3087. Braun, H. E.; Frank, R. (Prov. Pestic. Residue Test. Lab., Ontario Min. Agric. & Food, Guelph, Ontario N1G 2W1, Canada) **Organochlorine and organophosphorus insecticides: their use in eleven agricultural watersheds and their loss to stream waters in southern Ontario, Canada, 1975-1977.** *Sci. Total Environ.* 15(2): 169-192; 1980 (20 references).

A comprehensive study designed to determine the effects of agricultural land use activities on the quality of water entering the Great Lakes is presented. Eleven agricultural watersheds in southern Ontario were studied; 949 stream water samples were collected in 1975-77. A survey of insecticide use in each of the watersheds was conducted by questionnaire. Residues of the organochlorine and organophosphorus insecticides currently in use in those watersheds were determined by gas-liquid chromatography. It was determined that detectable residues of chlordane, heptachlor epoxide, and endosulfan were found in 1.6, 6.0 and 19.3% of the samples, respec-

tively. More than 50% of the total organochlorine insecticides were transported in the January-April period. Proposed water quality objectives were exceeded in 4% of samples by heptachlor epoxide, and in 14% of samples by endosulfan. Of the 16 organophosphorus insecticides known to be in use in the watershed, only chlorpyrifos (in 3 samples), ethion (2 samples), malathion (4 samples) and diazinon were found. Although 87 samples contained diazinon, 64 of them were found to originate from a non land-use activity. Field losses of organophosphorus insecticides occurred in the May-August period. Except for one sample of diazinon used in land activities and 77 samples of diazinon being used in indoor activity, no organophosphorus insecticides were found which exceeded the proposed water quality objectives.

80-3088. Cooke, M.; Roberts, D. J.; Tillett, M. E. (Dep. Inorg. Chem., Univ., Bristol BS8 1TS, England) **Polychlorinated naphthalenes, polychlorinated biphenyls and ΣDDT residues in British birds of prey.** *Sci. Total Environ.* 15(3): 237-246; 1980 (25 references).

A survey was made in England of organochlorine residues in tissues of small raptors. Samples were taken from casualty birds. Tissues from pectoral muscles, liver and kidney were blended and extracted with heptane by steam extraction. Analyses were performed by gas chromatography combined with mass spectroscopy. Pesticide residue levels varied among species and tissues. Level ranged form 10 to 710 ng/wet wt sample for DDT, 7 to 680 ng/wet wt sample for PCB, and 10 to 340 ng/wet wt sample for PCN. Trace amounts of PCTs were also detected. An analysis of environmental contamination in the areas where birds were collected correlated with pesticide levels detected in tissues.

80-3089. Cervelli, S.; Nannipieri, P.; Sequi, P. (CNR, Lab. Soil Chem., Pisa, Italy) **Interactions between agrochemicals and soil enzymes.** In: *Soil Enzymes* pp. 251-293; 1978 (262 references).

Extracellular enzymes accumulate in soils as a result of microbial activity in soil. These enzymes include amylase, cellulase, peroxidase, β-glucosidase, invertase, phosphatase, protease, urease, catalase and dehydrogenase. Agrochemicals can both influence the activity of these enzymes and be affected by these enzymes. In this review the effects of soil enzymes on fertilizers, herbicides, other pesticides and other agrochemicals as well as the influence of these compounds on the enzymes and the effects of these interactions on the soil environment are discussed. Propanil transformation by arylacylamidase to form the common herbicide degradation products DCA and TCAB is used as an illustration of the type of enzymatic biochemistry that occurs in the soil environment. DCA and TCAB are further degraded by other types of soil enzymes. The inhibition of extracellular and accumulated soil urease by substituted urea herbicides (fenuron, monuron, diuron, neburon and siduron) and urea is an example of direct agrochemical influence on soil enzymes. The indirect effects of these compounds have been postulated to include both biodegradation and physiological action.

80-3090. Brown, B. D.; Rolston, D. E. (Land, Air and Water Resour., Univ. California, Davis, CA 95616) **Transport and transformation of methyl bromide in soils.** *Soil Sci.* 130(2): 68-75; 1980 (14 references).

Studies were performed to determine the fate of methyl bromide (CH_3Br) following its use as a soil fumigant. A miscible displacement technique was used to evaluate sorption, dissolution, and irreversible sink processes as CH_3Br gas was passed through soil columns. A variety of soil types were tested. The production of Br^- resulting from the decomposition of CH_3Br was determined by injecting CH_3Br into a sealed flask containing soil. After an incubation period, the atmosphere above the soil was sampled and analyzed for Br^-. Peat-soil caused the greatest rate of Br^- formation, followed by sand. A first order kinetic model for the reversible sink term adequately described effluent curves. The authors contend that most of the CH_3Br used in soil fumigation enters the atmosphere, and the production of Br^- is relatively small. Since CH_3Br has a detrimental effect on ozone, it is thought to pose an environmental problem.

80-3091. Lafleur, K. S. (Dep. Agron. & Soils, Clemson Univ., Clemson, SC 29631) **Loss of pesticides from Congaree sandy loam with time: characterization.** *Soil Sci.* 130(2): 83-87; 1980 (8 references).

A field study was designed to characterize and analyze the loss of 4 disparate pesticides (prometryne, carbaryl, trifluralin, and metribuzin) from Congaree sandy loam soil with time. Methods, soil characteristics, and environmental factors were discussed in previous papers, but the overall data are presented in this paper. The loss of pesticide from soil is best represented by two-stage, first-order curves. The relatively steep slopes of stage 1 are characterized by a relatively large, unique rate constant (k_1), while the relatively shallow slope of stage 2 is characterized by a relatively small, less distinguishable rate constant (k_2). It is suggested that the time to 90% loss of the applied pesticide may be the most useful danger index. This value ranged from 23 days (metribuzin) to 1040 days (prometryne). It is further suggested that the curves may serve as models for other pesticides, and that the slopes of the two legs of individual pesticide curves can be approximately predicted from limited laboratory sorption, movement and loss data.

80-3092. Guthrie, T. F.; Bomke, A. A. (Dep. Soil Sci., Univ. British Columbia, Vancouver, British Columbia V6T

1W5, Canada) **Nitrification inhibition by N-Serve and ATC in soils of varying texture.** *Soil Sci. Soc. Am. J.* 44(2): 314-320; 1980 (21 references).

The objective of this research was to compare the effect of N-Serve (nitrapyrin) and ATC (amitrole) on silage corn *(Zea mays* L.) production and nitrification rates in two soils (silt and loamy sand). Urea was coated with the inhibitors at a rate of 1% of Al/wt N and applied as a band or broadcast in the spring of 1977 and 1978. The NH_4-N/NO_3-N ratio in the soil was calculated for each sampling date as an indicator of inhibitor effectiveness. Neither inhibitor significantly affected nitrification when applied as a broadcast treatment to either soil. In the silt, both inhibitors were equally effective in delaying nitrification when banded, but in the loamy sand ATC had a 5 times higher NH_4/NO_3 ratio than N-Serve 3 wk following application. The effectiveness of N-Serve persisted much longer in the silt (86 days) than in the loamy sand (23 days). This suggested that volatilization of N-Serve severely limited its effectiveness in the loamy sand. There was no significant improvement in crop yields or N content due to inhibitor treatment in either soil. ATC is recommended for further field evaluation in conjuction with band-applied soil fertilizers, particularly in coarse-textured soils. (Author abstract by permission, abridged)

80-3093. Farmer, W. J.; Yang, M. S.; Letey, J.; Spencer, W. F. (Univ. California, Riverside, CA) **Hexachlorobenzene: its vapor pressure and vapor phase diffusion in soil.** *Soil Sci. Soc. Am. J.* 44(4): 676-680; 1980 (15 references).

The vapor pressure of hexachlorobenzene (HCB), measured with the gas saturation technique, was related to the temperature by the equation $\log_{10}p = 12.94 - (5279/T)$ giving HCB vapor pressure values from 0.420×10^{-5} to 22.4×10^{-5} mm Hg over the temperature range 15 to 45°C. The heat of vaporization of HCB was calculated to be 24.2 kcal/mol. The vapor pressure data was used to measure the vapor phase diffusion of HCB in soil using a vapor-diffusion cell. The steady-state vapor diffusion of HCB in soil was directly related to soil air-filled porosity and was therefore greatly reduced by increased soil bulk density and increased soil water content. The apparent steady-state HCB diffusion coefficient was linearly related to the soil porosity term, $P_a^{10/3}/P_T^2$ where P_a is the soil air-filled porosity and P_T is the total soil porosity. The calculated diffusion coefficient in air for HCB was 1.0×10^4 cm²/day. (Author abstract by permission)

80-3094. Steenhuis, T. S.; Walter, M. F. (Dep. Agric. Eng., Cornell Univ., Ithaca, NY 14853) **Closed form solution for pesticide loss in runoff water.** *Trans. ASAE* 23(3): 615-620, 628; 1980 (15 references).

A research project designed to develop a simple model to predict runoff losses of pesticides from agricultural lands is described. In developing the model, it was assumed that adsorbed and dissolved phases of the pesticide are in equilibrium at all times and that the concentration of pesticides in the percolating water, runoff, and soil solution are equal in a zone near the surface of the soil (mixing zone). All variables are measurable except the depth of the mixing zone, and regression using pesticide runoff data reported in the literature was utilized to find a depth of 0.9 cm for this zone. Calculations are made based on various conditions that can exist during a rainfall. Among the periods considered are: water infiltrating, no ponding, no surface runoff; water infiltrating, ponding, surface runoff; and pesticide lost in overland flow and percolating water. Calculations are demonstrated for the steady state condition as well as the non steady state case. Pesticide runoff data from southern Georgia was used for verification, and a reasonable agreement existed between observed and predicted values.

80-3095. Isensee, A. R.; Yockim, R. S. (Pestic. Degrad. Lab., SEA, Beltsville, MD) **Freshwater micro-ecosystem development and testing of substitiute chemicals.** *US NTIS PB Rep.* PB-151,533: 39 pp.; 1980 (15 references).

The objective of the study was to develop better techniques for studying pesticides in aquatic model ecosystems. To achieve this objective, a model ecosystem was designed and built that utilizes the continuous dosing, flow-through system routinely used for chronic fish toxicity testing in combination with the organisms used in static model ecosystem testing. A previously developed recirculating static model ecosystem (simulating a sediment or erosional pesticide source) was simultaneously used with the flowing water system (simulating an effluent pesticide source) to test the behavior of 3 pesticides [pentachloronitrobenzene (PCNB; quintozene), simazine, and trifluralin]. Conditions in the static system favored pesticide degradation while the flowing system insured continuous pesticide exposure to the organisms. (Author abstract by permission)

80-3096. Zandvoort, R.; van den Born, G. W.; Braber, J. M.; Smelt, J. H. (Cent. Agrobiol. Res., NL-6700 AA Wageningen, The Netherlands) **Leaching of the herbicide bromacil after application on railroads in the Netherlands.** *Water Air Soil Pollut.* 13(3): 363-372; 1980 (10 references).

The extent of leaching of bromacil along a railroad bed was investigated. Field studies were performed by spraying the herbicide along a railroad bed at a rate of 1.8 kg/ha. Soil samples were then taken and the bromacil concentrations at various depths were determined by gas chromatography. The results indicated that the 10-20 cm layers always contained the most herbicide, but after 2 yr bromacil penetrated to a depth of 100 cm. Laboratory

studies were performed by making 3 columns of soil from along the railroad bed; one from the top 20 cm of untreated soil, one from between 50 and 90 cm of untreated soil, and a third from treated soil. Bromacil (1.02 mg) mixed with sand was added to the top of each column, then wetted daily. The columns were divided into 5 cm sections and analyzed. Results showed that the herbicide leached at a greater rate in the deeper soils and passed completely through the soil column, leaving from trace to 0.07 mg bromacil at various depths of the column. Higher levels of bromacil were retained by the column from the top soil layer (0.02-0.1 mg). The highest amounts were found in the column prepared from old, treated soils. It is suggested that because of low conversion rates of this pesticide, it could leach through the soil and eventually into the groundwater.

80-3097. Dore, M.; Legube, B.; Langlais, B. (Lab. Chim. XI, Triatement Eaux, UER, Sci. Fondam. Appl., Univ. Poitiers, F-86022 Poiters, France) **Mecanisme de l'ozonation des herbicides derives de l'acide phenoxyacetique: 2,4-D et M.C.P.A. [The mechanism of ozonation on derivatives of phenoxyacetic acids: 2,4-D and MCPA.]** *Water Res.* 14(7): 767-773; 1980 (20 references) (French).

Studies were performed to determine the effects of ozonation on 2,4-D and MCPA. Following ozonation, the degradation products were analyzed and confirmed by HPLC, CPV, and UV analysis. Stable reactional intermediates were formed by the cleaving of the aromatic ring. Degradation was associated with lower levels of ozone consumption for MCPA and slightly higher ozone consumption levels were observed for 2,4-D. As time progressed, ozone consumption decreased and phenoxy acid herbicide degradation increased. A degradation product containing an acetyl function appeared immediately in the medium. This was particularly easy to detect by an iodine haloform reaction with MCPA.

80-3098. Kleinstreuer, C.; Logan, B. E. (Dep. Chem. & Environ. Eng., Rensselaer Polytech. Inst., Troy, NY 12181) **A mathematical model simulating fish losses near power plants using rotenone data.** *Water Res.* 14(8): 1047-1053; 1980 (33 references).

A mathematical model is presented to simulate the losses of fish near a power plant. Predicting which species of fish are most likely to be impinged in greatest numbers was done by using rotenone collection data. The model was composed of submodels on flow into the plant, temperature, water quality, and fish populations. Losses were predicted to be due to interactions of physical and biological processes leading to impingement, enhanced mortality due to toxic material, depletion of dissolved oxygen, and fishing pressure.

80-3099. Arnold, J. S.; Farmer, W. J. (Green Valley Turf, Terra Bella, CA 93720) **Exchangeable cations and picloram sorption by soil and model adsorbents.** *Weed Sci.* 27(3): 257-262; 1979 (18 references).

The adsorption of picloram (4-amino-3,5,6- trichloropicolinic acid) was determined on an Aiken silt loam, on 3 cation exchange resins and on a single anion exchange resin. Adsorption data were evaluated using parameters in the Freundlich equation and their dependance upon cationic composition of the exchange complex, the ionic composition of the equilibrium solution, and the equilibrium solution pH. For the Aiken soil saturated with metallic cations the order of decreasing picloram adsorptive capacity was $Fe^{+3} = Cu^{+2} > Al^{+3} > Zn^{+2} > Ca^{+2} >$ native soil. Increases in adsorption compared to the native Aiken soil could be explained on the basis of decreases in the equilibrium solution pH except for Fe^{+3}, Zn^{+2}, and especially the Cu^{+2} treatments. The adsorptive capacity of the Aiken soil was altered by the addition of several salts simulating addition of fertilizer salts. The Cu^{+2} and Zn^{+2} salts were the only treatments showing increasing adsorption. (Author abstract by permission)

See also 80-3003, 80-3004, 80-3007, 80-3008, 80-3011, 80-3022, 80-3034, 80-3039, 80-3040, 80-3041, 80-3104, 80-3105, 80-3126, 80-3255, 80-3269, *and* 80-3298.

80-3100. Turner, K. (Tech. Res. Cent., Reckitt & Colman, Cape Town, Republic of South Africa) **Specifications for aerosol insecticide surface sprays using Malvern data. Part I.** *Aerosol Age* 25(9): 27-31; 1980.

A definition for surface insecticide sprays was proposed to protect spray users from excessive inhalation of toxins during normal use, to discourage the misuse of surface sprays as space sprays, and to ensure sufficient surface wetting by surface sprays with minimum amounts of fog formation. The Malvern particle sizer was employed to evaluate conformity of droplet size so that in an aerosol insecticide spray intended for surface application, not more than 5% of the particles are less than 50 μ in diameter and not more than 20% are greater than 250 μ at a distance of 50 cm from the actuator. These concepts were also applicable to other classes of sprays using different specifications.

80-3101. Anonymous **No excess in cancer deaths found in largest group ever studied for long-term effects of dioxin exposure.** *Am. Ind. Hyg. Assoc. J.* 41(1): 73; 1980.

A group of 121 workers believed to have been exposed to TCDD were studied for any excess in deaths resulting from cancer or cardiovascular disease. These particular employees had been exposed in an accident at a Monsanto Chemical Co. plant in West Virginia and subsequently developed chloracne. The analysis showed no apparent excess in total mortality of deaths from malignant neoplasms or diseases of the circulatory system could be found among these employees. The workers were followed over a period of nearly 30 yr. Also included in the surgery were workers engaged in 2,4,5-T production since the time of the accident but not exposed to TCDD via the accident and a control group.

80-3102. Anonymous **Epidemiologic evidence shows no long-term threat following exposure to dioxin.** *Am. Ind. Hyg. Assoc. J.* 41(3): A20; 1980.

Studies on industrial workers exposed to TCDD 30 years ago in an industrial accident indicate no increased incidence of cancer or cardiovascular disease among the exposed population. The total number of deaths among this group of 121 workers was only 32; lower than the number expected (46.41) compared to the national average. It is felt that this group of workers presented the best chance thus far for studying the possible long term effects of the chemical.

80-3103. Hickey, J. L. S. (Sch. Public Health, Univ. North Carolina, Chapel Hill, NC 27514) **Adjustment of occupational exposure limits for seasonal occupations.** *Am. Ind. Hyg. Assoc. J.* 41(4): 261-263; 1980 (7 references).

A previously reported model for predicting adjustments to permissible exposure limits has been extended to include adjustments for seasonal occupations. On the basis of the model, no credit (increase in exposure limits) may be allowed for a short work season unless the biological half-life in hours of the agent of concern is greater than 38W, in which W is the number of weeks in the work season. Modifications to PELs due to the longer work-days and work-weeks often associated with seasonal occupations are incorporated into a general equation for estimating PEL adjustments. The adjustments assumed no additional exposures the remainder of the year, and so do not apply to workers who merely move to other parts of the country and continue in a similar seasonal job. (Author abstract by permission)

80-3104. Oser, J. L. (NIOSH, Cincinnati, OH 45226) **Extent of industrial exposure to epichlorohydrin, vinyl fluoride, vinyl bromide and ethylene dibromide.** *Am. Ind. Hyg. Assoc. J.* 41(7): 463-468; 1980 (10 references).

Industrial hygiene studies of epichlorohydrin, vinyl fluoride, vinyl bromide and ethylene dibromide were conducted as part of an industry-wide evaluation of suspect cancer-causing chemical agents. At present there is no evidence that workers are experiencing adverse health effects at the reported exposure levels. Continued efforts to minimize worker exposure are recommended. (Author abstract by permission)

80-3105. Popendorf, W. (Sch. Pub. Health, Univ. California, Berkeley, CA 94720) **Exploring citrus harvesters' exposure to pesticide contaminated foliar dust.** *Am. Ind. Hyg. Assoc. J.* 41(9): 652-659; 1980 (28 references).

The results of measurements in 32 citrus groves treated with parathion, methidathion, dioxathion, paraoxon and supraoxon indicate that available and dislodgeable foliar dust measurements can predict aerosol mass concentrations produced during harvest with regression r^2 values of 0.41 and 0.25, respectively. The pesticide content of these foliar measurements correlates with whole-body dermal dosing via the deposition of pesticide containing aerosols with similar regression r^2 values of 0.63 and 0.75. Several lines of argument suggest that the wide range of particle sizes (< 1 μm to > 200 μm) underlies differences in foliar residue, aerosol, and dermal pesticide measurements. Significant implications of this report include the magnitude of the aerosols to which these workers are exposed (10-80 mg/m^3) and the potential ability to set reentry intervals based upon these predictable dermal dose estimates. (Author abstract by permission)

80-3106. Glass , R. I.; Lyness, R. N.; Mengle, D. C.; Powell, K. E.; Kahn, E. (Chronic Diseases Div., Bureau

Epidemiol., Cent. Disease Control, Atlanta, GA 30333) **Sperm count depression in pesticide applicators exposed to dibromochloropropane.** *Am. J. Epidemiol.* 109(3): 346-351; 1979 (12 references).

Male pesticide applicators who worked with dibromochloropropane (DBCP) were examined for possible testicular damage due to exposure to the nematocide. No signs of infertility or azoospermia which were found in factory workers exposed to DBCP were observed among DBCP applicators. Sperm count depression was correlated with duration of exposure for the current year but not with exposure in previous years. Depression of sperm count was found only in applicators involved in equipment calibration and irrigation setup work. Serum follicle-stimulating hormone levels were also found to be elevated with longer exposure to DBCP in the current year. This relationship was not found with serum luteinizing hormone levels of applicators. These findings suggest that testicular toxicity in men exposed to DBCP may occur in a shorter period of time than was previously reported.

80-3107. Hagerhall, B. (Min. Agric., S-10333 Stockholm, Sweden) **International cooperation to protect the Baltic.** *Ambio* 9(3-4): 183-186; 1980 (10 references).

A description is presented of the purpose and work of the Convention on the Pollution of the Marine Environment of the Baltic. It was clear that the severe problems of the Baltic Sea could not be solved on a country-by-country basis, and coordinated action was decided upon. The Helsinki Convention was signed by all the Baltic states in 1974 and went into effect on May 3, 1980. The convention covers discharges from land-based sources, including airborne pollution; discharges from ships, including oil, chemicals, sewage and garbage; dumping of wastes; and international cooperation to combat spillages of oil and hazardous substances [DDT and its derivatives, DDE, DDD (TDE) and PCBs] at sea. It is the most comprehensive convention signed thus far to protect the marine environment. An interim committee was active during the period 1974-80 in setting criteria and standards for discharges of harmful substances, monitoring and assessing the state of the marine environment, and conducting seminars on water protection technology. Future work planned by the convention is discussed, and similar conventions in other areas are described.

80-3108. Anonymous **Residus des medicaments veterinaires dans les denrees d'origine animale. [Veterinary drug residues in foods of animal origin.]** *Ann. Pharm. Fr.* 38(2): 185-190; 1980 (French).

Tolerances for veterinary drugs in animal products in France must be published, according to French law, to provide an opportunity for comment by the practitioners. The current concept regarding veterinary drug residues in France applies only to those residues which will be present in the products over a long period of time due to repeated administration or to the use of depot preparations. It also excludes drugs for occasional use (those to be given to a small number of animals for treatment of noncontagious diseases). In the case of depot preparations, the French National Pharmacopeia Commission has requested that the injection site be easily identifiable, or that marketing permits be accompanied by conditions of use which will ensure consumer protection. Antiparasitic drugs included in the current establishment of tolerances include toxaphene, dichlorvos, and lindane.

80-3109. Huizenga, L. J. (Int. Assoc. Waterworks Rhine Catchement Area, Amsterdam, The Netherlands) **Public water supply and the River Rhine.** *Aqua* (6): 27-32; 1980.

The history of efforts to control pollution of the Rhine River is briefly reviewed. The International Association of Waterworks in the Rhine Catchement Area (IAWR) came into being in January of 1970. At present the IAWA unites the interests of 85 separate waterworks in Switzerland, Austria, France, West Germany and The Netherlands. The major objective of the IAWR is to contribute toward the improvement and safety of drinking water supplies along the Rhine River and its tributaries. Directives for the water quality policy to be followed by central authorities have been established by the IAWR. Limiting values have been placed by the IAWR on pollutants to maintain water quality. These limiting values are daily average values which may not be exceeded, particularly at the intake points of waterworks. The discharge of 16 substances, including 12 organochlorine pesticides, PCBs and PCTs, cadmium and cadmium compounds, mercury and mercury compounds, and cancer inducing substances, was banned by the IAWR.

80-3110. Alcorn, E.; Angel, E.; Hughes, J. H. (Dep. Emerg, Serv., Univ. Ariz. Health Sci. Cent., Tucson, AZ 85724) **Pesticides in Arizona. An update.** *Ariz. Med.* 37(1): 36-38; 1980 (13 references).

The industry of farming ranks fourth among income producing occupations in the state of Arizona. The amount of pesticides sold in Arizona in 1977 was in excess of 14 million pounds. An average of 67 hospital admissions for pesticide poisoning occurred in Arizona in each of the years 1971, 1972 and 1973, with 7% of these being related to occupational exposure. Most of these occupational exposures were of persons involved in the manufacturing or formulating of the chemicals, rather than agricultural workers. A preponderance of cholinesterase-inhibiting organophosphates was noted among the causes requiring hospitalization. Out of the average number of hospitalizations, a substantial fraction, 17.4%, were found in children under the age of five. Various reasons indicate that this estimate is far too low. It is stressed that increased

awareness of this problem by physicians in Arizona should help improve both identification and reporting of cases.

80-3111. Peacock, D. B.; Palmateer, S. C. (Regist. Div., Off. Pestic. Programs, US EPA, Washington, DC 20460) **Comparison of EPA animal biology laboratory and company laboratory efficacy data for federally registered rat and mouse baits.** *ASTM STP 680* pp. 11-19; 1978 (11 references).

The efficacy of various federally registered rat and mouse baits tested by the US EPA and commercial laboratories were compared. Dry, ready-to-use baits which were evaluated under the same criteria were used in 364 tests. Some active ingredients present in the baits used in various combinations were diphacinone, warfarin, and Prolin. Baits were examined for mean percent acceptance and mean percent mortality. Bait products showed better percent acceptance and mean percent mortality in company tests than in EPA tests. Extent of agreement between 99 matched sets of EPA and company data was also also investigated. Agreement of data was noted in 65 cases, and in the remaining 34 cases, only 5 products passed EPA tests for bait acceptance and mortality. Retests by individual companies have confirmed EPA laboratory product evaluations. Some reasons for the disparities between EPA and private laboratory results and measures to correct these differences are discussed. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3112. Howard, W. E.; Park, J. S.; Cho, W. S.; Kim, S. I. (Wildl. & Fish. Biol., Univ. California, Davis, CA 95616) **A safe and inexpensive way of making South Korean villages rodent-free.** *ASTM STP 680* pp. 50-57; 1978.

A program for village rodent control developed in South Korea which is safe to humans and non-target organisms and uses little bait is described. Stations are equipped with non-poisonous bait such as rice to determine if rodents are prevalent in a given area. If rats are present, 25 g of a prebait are placed in a station. If all of the prebait is eaten, then an acute rodenticide bait, usually Vacor [containing RH 787 (pyriminil)] is supplied. As a final step, anticoagulant bait might be tried until all the rodents are controlled. When toxic bait is no longer being eaten, the non-poisonous bait is left in the station until more rodents appear. Pre- and post-control census techniques, bait acceptance, methods of survivor determinations and distinguishing between new invaders and bait-shy individuals are discussed. An example of this system at work in a South Korean village is given to emphasize its complexity and the need for structural organization in order to make rodent control effective. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3113. Beck, J. R.; Stein, H. S., Jr. (Biol. Environ. Consult. Serv., Birmingham, MI 48008) **Rationale for testing vertebrate pesticides and devices in actual field situations.** *ASTM STP 680* pp. 289-293; 1978.

Over the past 25 yr, problems have occurred in the extrapolation of laboratory and field data directly to the control of vertebrate pests in actual field conditions. Corrective measures were initiated under the Federal Insecticide, Fungicide and Rodenticide Act to prevent further misuse of pesticides in vertebrate control programs. Nine cases of product misuse are presented and several influences and negative factors affecting current vertebrate animal control research are discussed. Some products that were misused included Checkmate (MSMA + cacodylic acid), zinc phosphide, sodium fluoride, Avitrol (4-Ap), DRC-1339, Furthermore and ABC 123 rat poisons and 1080 (sodium fluoroacetate). The advantage of field testing by qualified applicators under actual market conditions are also listed. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3114. Akerman, J. W. (US EPA, Washington, DC) **Environmental Protection Agency's regulatory requirements for wildlife toxicity testing.** *ASTM STP 693* pp. 3-8; 1978.

The regulatory authority of the US EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) in relation to wildlife toxicity testing is explained. FIFRA allows the EPA to decide what pesticides may be registered and for what they may be used. The EPA relies on the results of scientific research to determine if a chemical has severe adverse effects. To evaluate a pesticide's environmental safety, its toxicity, fate and exposure, and the interaction of these 2 factors are examined. The basic wildlife toxicity testing regime requires a rat and an avian single-dose oral LD50, and a dietary LC50 on 2 different avian species. Other studies which may be required for avian and mammalian wildlife include reproduction, pen field, and full field tests. The EPA toxicity testing format proceeds in a hierarchical manner with all manufacturing-use products and products formulated for outdoor use being subject to the first level, simple, short-term laboratory studies. [Paper presented at the 1978 ASTM Avian & Mammalian Toxicology Symposium]

80-3115. Palmisano, P. A. (Child. Hosp., Birmingham, AL 35233) **Hospitalization as a measure of clinical toxicity.** *Clin. Toxicol.* 16(3): 377-380; 1980 (1 reference).

Acute animal toxicity data are useful in comparing a series of compounds with regard to a given toxic endpoint. Such information is not obtainable from human populations, and clinicians must often be guided by empiric judgement in treating acute ingestions. This experimental survey compared the calculated percent of cases hospitalized for 12 common substances (including D-Con insecticide spray) ingested by young children as reported by

the National Clearinghouse for Poison Control Centers for 1973-1976. Such ratios are offered as measures of clinical toxicity and as helpful modes of input in guiding patient management.

80-3116. Klingberg, M. A.; Papier, C. M. (Dep. Epidemiol., Israel Inst. Biol. Res., Ness-Ziona, Israel) **Environmental teratogens. Their significance and epidemiologic methods of detection.** *Contrib. Epidemiolog. Biostat.* 1: 1-22; 1979 (131 references).

Incidents involving environmental teratogens are reviewed. Various drugs have been investigated for possible teratogenic effects. The principal anticoagulant studied is warfarin. Defects such as nasal hypoplasia, optic atrophy, skeletal defects and mental retardation have been reported following administration of this drug to the mother. The toxicity of PCBs was demonstrated in Kyushu, Japan in 1968 after the accidental ingestion of PCBs by pregnant women through contaminated oil. Excretion through the breast milk resulted in small babies with dark skin, eye disease and other abnormalities. Chloracne was common among the exposed adults. Minamata disease is cited as a further example of environmental contaminants causing teratogenic effects. The improper disposal of salvage oil contaminated with TCDD resulted in fetal toxicity and malformations among animals so exposed. Insecticides, taken as a group, have not been found to be highly embryotoxic. Herbicides, however, have been implicated in birth defects following massive defoliation in Vietnam. Teratogenic effects have been reported for rats and mice exposed to 2,4,5-T with 30 ppm of the contaminant TCDD present. Use of methylmercury as a fungicide resulted in disaster in Iraq when bread was made from treated seed grain.

80-3117. Branson, D. R. (Environ. Sci. Res., Dow Chem. Co., Midland, MI 48640) **Prioritization of chemicals according to the degree of hazard in the aquatic environment.** *Environ. Health Perspect.* 34: 133-138; 1980 (15 references).

Special attention has recently been given to chemicals termed priority pollutants or toxics because of their discharge into public water supplies at maximum possible limits. The 129 priority chemicals, which include many pesticides, were not all selected on the basis of exposure and effect data. A system of hazard assessment is proposed to scientifically select priority chemicals based on their effects on the aquatic environment. In this system, chemicals with the least margin of safety are the highest priority chemicals. No-observable-effect levels are established based on chronic or sensitive life stage tests with aquatic organisms and acceptable daily intake rates for fish consumers. Ambient exposure levels are either measured in fish and water or estimated from a simple nomogram involving environmental release rate, ratio of dissipation to bioconcentration potentials, or fish ambient residues. The prioritization system based on hazard assessment was tried on PCB, di-2-ethylhexyl (phthalate dioctyl phthalate), linear alkylbenzene sulfonate and pentachlorophenol (PCP).

80-3118. Stara, J. F.; Kello, D.; Durkin, P. (ECAO EPA, Cincinnati, OH) **Human health hazards associated with chemical contamination of aquatic environment.** *Environ. Health Perspect.* 34: 145-158; 1980 (88 references).

Continued chemical pollution of the limited supply of water available for human use may pose a significant health hazard in the near future. Establishment of an ambient water quality criteria is recommended to safeguard human health and protect aquatic life. To formulate water quality standards based on health effects to humans, data on adverse effects, sources of exposure and pharmacokinetics must be examined. Studies on sources of exposure will be required to assess the role of exposure to toxins in water in comparison to other environmental exposure routes. The mode of toxic action may be ascertained through pharmacokinetic experiments in animals with extrapolation to man. Acute, chronic and subchronic toxicity data should be evaluated and tests for mutagenicity, carcinogenicity and teratogenicity should also be carried out. Data analysis should distinguish between threshold and nonthreshold effects (mutagenicity and carcinogenicity). An acceptable increased level of risk is calculated for mutagens and carcinogens which is used to estimate the dose which would result in this increased level of risk through extrapolation models. Other toxins are assigned threshold according to acceptable daily intake levels for man which would presumably cause no adverse effects. It is suggested that methodologies to perfect risk assessment of toxic compounds in water be researched.

80-3119. Atabaev, Sh. T. (Uzbek Res. Inst. Public Health Hyg. & Occup. Dis., Tashkent, USSR) **Gigienicheskie aspekty primeneniia novykh pestitsidov v usloviiakh zharkogo klimata. [Hygienic aspects of the use of new pesticides in hot climate.]** *Gig. Sanit.* 45(5): 10-11; 1980 (1 reference) (Russian).

Characteristic features of environmental contamination with various pesticides under hot climatic conditions (central Asia) are discussed. Hot climate enhances the evaporation of pesticides from treated plants and soil, thus causing secondary contamination of the ambient air. High temperature increases the toxicity of pesticides. In addition, high temperature markedly increases the amount of drinking water consumed, which may be contaminated with pesticides.

80-3120. Khasanov, V. Kh. (Uzbek Res. Inst. Public Health Hyg. & Occup. Dis., Tashkent, USSR) **Metody**

opredeleniya sanitarno-zashchitnykh zon v svyazi s primeneniem pestitsidov v khlopkovodstve. [Methods of determination of sanitary-protective zones after pesticides application in cotton-growing.] *Gig. Sanit.* 45(5): 36-38; 1980 (Russian).

Formulas for calculating the area of a sanitary-protective zone after treatment of cotton fields with organochlorine and organophosphorus pesticides are described. The use of these formulas makes it possible to calculate which fraction of the total land area around the village or body of the water should be excluded from treatment with highly toxic pesticides.

80-3121. Vyberal'ski, D. Yu. (Inst. Chem. & Storage, Agric. Acad., Szczein, Poland) **Ochistka pit'evoi vody ot ostatochnykh kolichestv nekotorykh pestitsidov koaguliatsiei i ozonirovaniem. [Use of coagulation and ozonization for purification of drinking water from residual amounts of some pesticides.]** *Gig. Sanit.* 45(5): 48-49; 1980 (2 references) (Russian).

To evaluate the comparative efficacy of drinking water purification by coagulation with $Al_2(SO_4)_3.18\ H_2O$ and ozonization, the insecticides hexachlorocyclohexane (BHC), DDT, DDE, Sevin (carbaryl), propoxur, and chlorfenvinphos were dissolved in water (1 mg Al/l). Solutions were either incubated with coagulant (0.35 or 0.75 mg/l) or subjected to ozonization (1, 2, 3, 4 and 5 mg O_3/l). Pesticide residues were determined chromatographically. Ozonization was found to decrease pesticide concentrations; the decrease ranged from 14.4% for BHC to 29.0% for Sevin. Coagulation provided less effective purification.

80-3122. Ivashina, S. A.; Komarova, L. I. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polymers & Plastic., Kiev, USSR) **Gumoral'nye i kletochnye faktory nespetsificheskogo immuniteta u lits kontaktiruyu shchikh s tsinebom. [Humoral and cellular immunity in persons exposed to zineb.]** *Gig. Sanit.* 45(6): 82-83; 1980 (5 references) (Russian).

Indices of humoral and cellular immunity were studied in 40 persons who had an occupational exposure to the dithiocarbamate fungicide zineb and in 20 healthy controls. Duration of exposure to zineb ranged from several mo to 5 yr. Exposure to zineb resulted in significant increase of the phagocytic function of neutrophils (62.2-63.8%, compared with 55.4% in controls) with a concomitant increase in the alkaline phosphatase activity (1.2-1.6 IU, compared with 0.86 IU in controls), a decrease of lysozyme level, and inhibition of the redox enzymes. The degree of changes depended upon the duration of the exposure to zineb.

80-3123. Hoenig, S. A.; Sill, G. T.; Kelley, L. M.; Garvey, K. J. (Dep. Electr. Eng., Univ. Arizona, Tucson, AZ 85721) **Destruction of bacteria and toxic organic chemicals by a corona discharge.** *J. Air Pollut. Control Assoc.* 30(3): 277-278; 1980 (3 references).

The use of a corona discharge to destroy bacterial spores and toxic organic materials was investigated. Microbial aerosol tests were performed with spores of *Bacillus thermophilius*. Chemical testing was performed on methyl parathion commercial grade, diluted 50:1 with water and aerosolized. The aerosol/air mixture was drawn into the corona discharge apparatus at 1.5 l/min. The effluent was bubbled through benzene to trap any unreacted pesticide. Other tests were performed using methyl parathion vapor. With the system not operating, the methyl parathion level was 0.8 μg/l. With the operation of the corona, methyl parathion concentration was less than 0.006 μg/l, the detection limit of the chromatograph. This finding suggests an effective decrease of 99.3% or more. No traces of methyl paraoxon were found. Methyl parathion fume tests gave an initial concentration of 3.3 μg/l of air which was cut to 0.01 μg/l with the system, a decrease of 99.7%.

80-3124. Cole, P.; Merletti, F. (Dep. Epidemiol., Harvard Sch. Public Health, Boston, MA 02115) **Chemical agents and occupational cancer.** *J. Environ. Pathol. Toxicol.* 3(3): 399-417; 1980 (98 references).

This review presents current knowledge regarding chemicals known to be or suspected of being human carcinogens which are encountered in the occupational setting. Efforts to estimate the magnitude of the problem of occupationally-induced cancer are reviewed. Epidemiological approaches to the control of occupational cancer are suggested. Evidence of carcinogenicity to man derived from occupational settings exists for insecticide and herbicide producers and workers exposed to arsenic and cadmium. Inadequate evidence of carcinogenicity from occupational exposure by pesticide producers and users exists for amitrole, chlordane/heptachlor, epichlorohydrin, BHC and PCBs.

80-3125. Cook, R. R.; Townsend, J. C.; Ott, G.; Silverstein, L. G. (Dow Chem., Mildland, MI 48640) **Mortality experience of employees exposed to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD).** *J. Occup. Med.* 22(8): 530-532; 1980 (11 references).

A study was made of 61 workers employed at a chemical plant and exposed to TCDD (dioxin) during 1964. Of the 61 employees, 22 were classified into the low exposure group, and 39 into the group whose jobs suggested high potential exposure. Acne-like lesions were noted on 49 of the 61 men, at degrees ranging from questionable to severe. Overall mortality in this cohort was only 50% of that which would have been expected, although the small cohort size provides results of low statistical power. There were fewer cardiovascular related deaths than would have

been expected. Cancer mortality was slightly elevated, but each of the malignancies was of a different type, and none was apparently primary in the liver, which has been a site of major concern. Only one of the cancer deaths occurred in an individual with documented chloracne. It was concluded that exposure to TCDD at levels sufficient to produce chloracne did not increase overall mortality, and does not appear to increase the risk of cardiovascular death.

80-3126. Anonymous **Pesticides.** In: *Malignant Neglect.* Highland, J. H. et al., eds. (Alfred A. Knopf Inc.: New York): CH06: 117-136; 1979.

The regulation of pesticide use is discussed. The government agencies empowered to legislate pesticide registration and use are described, and the procedures which tend to encumber the legislative process are considered. The case of the banning of aldrin/dieldrin is presented in detail to illustrate the procedures that industry and agribusiness use as delaying tactics. Data on the carcinogenic effects of these insecticides are described, along with information on their persistence and widespread distribution in the environment. It is noted that the EPA banned aldrin/dieldrin in 1974, but the litigation took five years. The banning of heptachlor and chlordane consisted of a similar lengthy process. The backlog of cases to be reviewed is suggested as another reason why potentially dangerous pesticides continue to be used.

80-3127. Matsushita, T.; Nomura, S.; Wakatsuki, S.; Sugaya, H. (Sch. Hyg., Fac. Med., Kagoshima Univ., Kagoshima, Japan) **[The occurrence of skin impairment due to agricultural pesticides in Japan.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 534-535; 1980 (Japanese).

Data from a 3 yr clinical investigation on the incidence of skin damage due to the use of agricultural chemicals and pesticides are reported. A total of 168 incidents occurred, 105 male and 63 female; most (83.3%) occurred in the period from April to August. A correlation between pesticide exposure and incidence was noted. Causative agents were sulfur compounds and organophosphates, in 35.7% and 35% of the cases, respectively; and then, carbamates, herbicides, fungicides, antibiotics and copper-containing compounds, in decreasing order. Skin injury occurred on the day of exposure in 46% of the cases. Copper compounds caused delayed injury. Interactions of 2 or more pesticides were frequently observed. The areas most affected were the face (53%), legs (12%), abdomen (10%), and waist (10%). Inadequate protection and carelessness were the 2 most frequently cited causes of skin injury.

80-3128. Wright, W. (Meneage Hosp., Helston, Cornwall, England) **Clouds of misery.** *Nurs. Mirror* 151(8): 24-25; 1980.

Cases where dioxin (TCDD) has escaped into the environment are briefly reviewed. These include the accident at Seveso, Italy, in 1976; exposure of workers in the US during the manufacture of 2,4,5-T in 1949; the accidental discharge of dioxin at the Coalite factory in Bolsover, Derbyshire, England in 1968; and the exposure of German workers which resulted in psychological effects, damage to the kidneys and liver, and one case of cancer of the gut. Experiments have demonstrated that, in the rat and mouse, dioxin exposure can result in birth defects including cleft palate. Late reactions may include cirrhosis and necrosis of the liver, renal damage, bronchitis, encephalitis, splenic damage and polyneuritis. Delayed but permanent lesions of a psychopathological/neurological nature may also develop. While no deaths have been reported in humans as a result of dioxin, a number of serious and refractory cases of illness have been reported, especially to children.

80-3129. Parker, D. K.; Cox, W. L. (Goodyear Tire & Rubber Co., Akron, OH) **Detoxifying PCB-contaminated transformer and heat-transfer fluids.** *Plant Eng.* 34(17): 133-134; 1980.

The described treatment allows for safe disposal of PCB transformer and heat-transfer fluids through the extraction of the toxic ingredients from the fluids and the subsequent conversion of the toxicants into a nontoxic residue which can be safely incinerated. The contaminant-free fluids can be recovered for reuse. Successful trials of the method were carried out at a Goodyear plant where batches of PCB-containing heat-transfer fluids were converted to environmentally safe substances. PCB content is reduced by this method from 82 ppm to < 10 ppm. The method for removing PCB-contaminated fluids consists of reaction of the fluids with an organosodium reagent, thus destroying the bonds that held the PCBs together and created the toxic effects. The reaction takes less than 5 min, and only small amounts of heat are generated. The treatment is also applicable to polybrominated biphenyls, DDT, and TCDD contaminated pesticides and herbicides.

80-3130. Greene, D. F.; Petrocci, A. N. (Onyx Chem. Co., Jersey City, NJ) **Formulating quaternary cleaner disinfectants to meet EPA requirements.** *Soap Cosmet. Chem. Spec.* 56(8): 33-61; 1980 (6 references).

All pesticide-type products were originally regulated by the USDA as mandated by the Federal Insecticide, Fungicide and Rodenticide Act of 1947. All pesticides sold in the US had to be registered with the USDA. This Act provided for the registration, proper labeling, and control of pesticides. In 1972 control was passed to the EPA, and the law amended to include requirements in the area of efficacy, toxicology and chemistry. The original efficacy procedure for evaluating disinfectants and disinfecting detergent products was the Phenol Coefficient Test. More recently developments have

led to the AOAC Use Dilution Test, designed to determine efficacy of a germicide by exposing contaminated hard non-porous surfaces to the test disinfectant for a 10 min contact period. This remained the standard test until 1979 when the EPA requirements for one-step cleaner disinfectant products was revised. This revision called for the inclusion of 5% blood into the disinfectant test to simulate use conditions for cleaning and disinfection. When a product passes the tests now required, it can be labelled that efficacy tests have demonstrated it to be an effective bactericide, fungicide and virucide in the presence of organic soil (5% blood serum).

80-3131. Marshall, S.; Whorton, D.; Krauss, R. M.; Palmer, W. S. (Dep. Urol., Sch. Med., Univ. California, San Francisco, CA) **Effect of pesticides on testicular function.** *Urology* 11(3): 257-259; 1978 (5 references).

Serum levels of follicle-stimulating hormone, luteinizing hormone, and testosterone were determined in 38 men and 3 women occupationally exposed to dibromochloropropane (DBCP). Semen of 27 nonvasectomized men was analyzed, and 10 men (including both vasectomized and nonvasectomized) underwent testicular biopsies. Results of endocrine studies, semen analyses and testicular biopsies indicated that subjects exposed to DBCP for longer periods of time showed greater impairments in testicular function. Almost complete absence of sperm was noted in men exposed to DBCP for longer than 3 yr. No abnormalities were found in the 3 women studied. FSH and LH levels were elevated in men with increased spermatogenic impairment after long periods of DBCP exposure. Testicular biopsies showed decreased spermatogenic activity in men exposed to DBCP for more than 12 mo. Amount of testicular damage was closely correlated with length of exposure to DBCP.

See also 80-3005, 80-3009, 80-3011, 80-3014, 80-3026, 80-3030, 80-3031, 80-3037, 80-3038, 80-3039, 80-3041, 80-3050, 80-3062, 80-3066, 80-3071, 80-3208, 80-3213, 80-3218, 80-3219, 80-3222 *and* 80-3268.

80-3132. Salanki, J.; Varanka, I. (Biol. Res. Inst., Hungarian Acad. Sci., Tihany, Hungary) **Effect of some insecticides on the periodic activity of the freshwater mussel *(Anodonta cygnea* L.).** *Acta Biol. Acad. Sci. Hung.* 29(2): 173-180; 1978 (20 references).

The survival and pumping behavior of the freshwater mussel *Anodonta cygnea* L. were evaluated after exposure to Hungaria L-7 (10^{-6} to 10^{-1} g/l, AI lindane), Dimercon-50 (10^{-6} to 10^{-1} g/l, AI phosphamidon), Thimet-10 G (10^{-5} to 10^{-1} g/l, AI phorate), and Satox 20 WSC (10^{-1} to $> 10^{-3}$ ml/l, AI trichlorfon). Depending on their concentrations, Hungaria L-7, Thimet-10 G, and Satox WSC significantly influenced the activity of the fresh-water mussel. Mortality resulted from Thimet and Satox. Dimecron-50 exerted only a slight effect on the activity of the mussels. It is concluded that the activity of mussels can be used as a suitable test for evaluating the biological activity of water pollutants.

80-3133. Traczyk, Z.; Blaton, O.; Arczynska, E.; Wit, B.; Sawicki, W.; Gorski, T.; Rudowski, W. (Inst. Hematol., Med Acad., Warsaw, Poland) **Effect of chlorinated pesticides on leukocyte migration *in vitro*.** *Acta Med. Pol.* 19(4): 451-459; 1978 (19 references).

The leukocyte migration inhibition (LMI) test was used to detect supposed leukocyte sensitization to DDT or γ-HCH (γ-BHC; lindane). Leukocytes were taken from 16 healthy subjects and 21 patients suffering from various hematological disorders. The leukocytes of 15 of the 21 patients and of 1 of the 16 healthy subjects reacted to *p,p'*-DDT, to *p,p'*-DDE, and/or to γ-HCH. Leukocyte migration under the influence of the pesticides was inhibited in these subjects. The degree of inhibition varied from subject to subject and also from chemical to chemical. The mean leukocyte migration value in control cultures (without exposure to pesticides) was significantly lower for reactive patients than for unreactive ones. While it is not possible to judge a relationship between the reactivity to pesticides and the presence of hematological disorders, the high frequency of patient sensitization, 70%, as compared with healthy subjects, 6%, may suggest that a relationship exists.

80-3134. Jirasek, J.; Adamek, Z.; Nguyen Xuan Tan; Holcman, O. (Fac. Agron., Univ. Agric., Brno, Czechoslovakia) **Stanoveni akutni toxicity insekticide Dursban pro ryby. [Estimation of the acute toxicity of the insecticide Dursban for fish.]** *Acta Univ. Agric. Brno Fac. Agron.* 26(3): 51-56; 1978 (7 references) (Czech).

In general, the organophosphorus pesticides pose a great danger to animals. The effects of the organophosphorus insecticide Dursban (chlorpyrifos) were evaluated in 6 species of fish found in Czechoslovakia. Acute toxicity tests revealed an LC50 value below 0.01 ppm for all species tested except *Carassius carassius* which had an LC50 value of 0.014 ppm. In all of the species, Dursban intoxication caused increased slime production, marked pigmentation, gill epithelium damage, increased blood pressure in internal organs, and decreased oxygen consumption. Due to the high toxicity of Dursban to fish, it is recommended that the insecticide should not be sprayed near water surfaces or where water runoff may occur.

80-3135. Kuehnel, F.; Kulpe, M.; Kramer, W. (VEB Chemiekombinat Bitterfeld, DDR) **Nove skusenosti a moznosti pouzitia Flordimexu. [New findings on the potential application of Flordimex.]** *Agrochemia* 20(4): 117-121; 1980 (Czech).

The action characteristics of the East German growth regulator Flordimex, containing as its active agent ethephon (β-chloroethylsulfonic acid), include accelerated ripening of fruit, vegetable and ornamental flower crops. Other dose-dependent effects on biological processes are also exerted, such as causing easier detachment of fruits from stems, which facilitates mechanized harvesting of fruit using shakers; early blossom induction in ornamental flowers of the *Bromylaceae* genus, which reduces the cultivation period by 8 to 12 mo; branching out of strawberry plants; acceleration of maturation of tobacco, hops, and coffee beans; and acceleration of ripening of oranges. These effects are attributable to the release of ethylene in the mildly acid or neutral medium of the cytoplasm of living cells. The LD50 (peroral) is > 5000 mg/kg in rats. Flordimex irritates rabbit skin on contact and is toxic to rats when inhaled for 4 days. In Czechoslovakia Flordimex is certified for only a limited number of applications.

80-3136. Randell, W. F.; Bradley, R. E. (Dep. Prev. Med., Coll. Vet. Med., Univ. Florida, Gainesville, FL 32610) **Effects of injectable famphur on young Brahman and Angus cattle.** *Am. J. Vet. Res.* 41(9): 1423-1426; 1980 (9 references).

Five young Angus and 6 Brahman bulls were given single im injections of a 35% solution of famphur (ENT-25644) at a dose level 5 times greater than the recommended dose of 83.2 mg/kg. Five of the 6 Brahman bulls showed signs of severe organophosphorus intoxication and 4 died within 48 hr after dosing. Only one Angus bull displayed signs of toxicosis, but it recovered after 14 days. In a second experiment, clinical and cholinesterase response were studied in young Brahman bulls, steers and heifers injected im with famphur at doses of 16.6, 33.3 or 49.9 mg/kg. After 28 days, a significant inhibition in red blood cell cholinesterase activity was noted in all 3 dose groups. A lower dose level of famphur (33.3 mg/kg) induced toxicosis in Brahman bulls but not in steers or heifers. No significant differences due to sex interactions were observed in the inhibition of red blood cell cholinesterase levels by famphur.

80-3137. Albrecht, B.; Dooh-Priso, E.; Faudemay, F.; Pelissier, M. A. (Lab. Biol., CNAM, F-75141 Paris 03, France) **Induction of rat liver microsomal oxygenases by lindane: influence of a high fat diet.** *Ann. Nutr. Aliment.* 34(1): 9; 1980.

Young male Wistar rats were fed either a normal or a high fat diet. Rats from each dietary group were treated for 4 wk with lindane added to the diet. The diets were spiked with 18 μg lindane/Kcal; 60 ppm lindane in the normal fat content diet and 93 ppm lindane in the high fat diet. Aminopyrine-*N*-demethylation was accelerated by lindane treatment. Linoleic acid content in microsomal phosphatidylcholine was increased by 32%. The hexobarbital sleeping time was lowered by lindane exposure, but this was more significant in the low fat diet rats. For rats receiving both lindane and the high fat diet the probability of an NADPH failure for hexobarbital liver metabolism was discussed.

80-3138. Rosas, S. B.; Secco, M. C.; Ghittoni, N. E. (Dep. Biol. Molec., Univ. Nac. Rio Cuarto, Rio Cuarto, Cordoba, Argentina) **Effects of pesticides on the fatty acid and phospholipid composition of *Escherichia coli*.** *Appl. Environ. Microbiol.* 40(2): 231-234; 1980 (29 references).

Cells of *Escherichia coli* contained an altered phospholipid and fatty acid composition when grown in the presence of some pesticides. Whereas parathion increased the concentration of all phospholipid species without changes in their polar head groups, DDT (dichlorodiphenyltrichloroethane) decreased the proportion of neutral serine-derived phosphatides and dieldrin decreased the proportion of negatively charged phospholipids. The saturated/unsaturated plus cyclopropane fatty acid ratio was increased in all cases. The changes suggested that cells adapted their membrane lipids to compensate for the presence of pesticides in the environment. (Author abstract by permission)

80-3139. Sasaki, M.; Suzuki, K.; Ichikawa, T.; Sawada, M.; Iwane, Y.; Ando, K. (Res. Lab., Chugai Pharm. Co. Ltd., Takada, Toshima, Tokyo 171, Japan) **Microbial degradation of a macrotetrolide miticide in soil.** *Appl. Environ. Microbiol.* 40(2): 264-268; 1980 (8 references).

Macrotetrolide, a miticide consisting of tetranactin, trinactin, and dinactin, was readily biodegradable and hence did not accumulate in soil. [*U*-^{14}C]Macrotetrolide was rapidly degraded via its constituent hydroxycarboxylic acids to carbon dioxide and water. In culture media, however, the mixture was hydrolyzed to homononactic and nonactic acids by 3 strains of *Bacillus* sp. and 2 of *Micrococcus* sp. The latter strains were able to hydrolyze 500 μg of the antibiotic per ml within a few days and to grow in the presence of 4000 μg of the antibiotic per ml. However, they were unable to assimilate the constituent acids which accumulated in the culture medium. (Author abstract by permission)

80-3140. Salmon, T. P.; Marsh, R. E. (Coop. Ext., Univ. California, Davis, CA 95616) **Age as a factor in rodent susceptibility to rodenticides – a review.** *ASTM STP 680* pp. 84-98; 1978 (45 references).

The effects of age in the susceptibility of animals to rodenticides is reviewed. Some compounds that have been studied in terms of their toxicity to different age groups of a single species include ANTU, anticoagulants (warfarin, thallium, and brodifacoum), arsenic trioxide, barium carbonate, chemosterilants, crimidine, endrin and strychnine. If the difference in mortality between different age groups of the same species is large, and if baits cannot be strengthened without lessened bait acceptance, then the age differential mortality will become significant. The implications of the effects of age on field efficacy tests and laboratory experiments are considered. The age-related toxicities of some non-target species are given and age-specific toxicity tests are outlined. It is suggested that age-related behavioral characteristics may independently affect toxicity or may combine with other factors to produce susceptibility to pesticides. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3141. Kenaga, E. E.; Fink, R. J.; Beavers, J. B. (Dow Chemical Co., Midland, MI 48640) **Dietary toxicity tests with mallards, simulating residue decline of chlorpyrifos and avoidance of treated food.** *ASTM STP 693* pp. 36-44; 1978 (8 references).

The effects of chlorpyrifos on repellency, lethality, food intake, and growth responses of mallard ducks were examined in feeding tests. Ducks were maintained for 11 days on feed treated with chlorpyrifos in levels which represented a 5-day half-life logarithmic decline rate to simulate residues on foliage in the environment. Food avoidance was observed at all levels tested (56-1124 ppm) which resulted in wt-growth declines. When given a choice of untreated or chlorpyrifos-treated food, most ducks consumed the pesticide-free feed. In tests where dietary levels of chlorpyrifos were held constant under standard conditions, initial concentrations resulted in LC50s of 354 ppm as compared to 644 ppm when the decreasing logarithmic levels of chlorpyrifos were used. These results suggest that a more accurate estimation of the avian toxicity of chlorpyrifos may be acquired in tests which offer both treated and untreated food options and which simulate natural rates of residue decline in foliage and other food sources. [Paper presented at the 1978 ASTM Avian & Mammalian Wildlife Toxicology Symposium]

80-3142. Stickel, W. H.; Kaiser, T. E.; Reichel, W. L. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Endrin versus 12-ketoendrin in birds and rodents.** *ASTM STP 693* pp. 61-68; 1978 (7 references).

Tests on rats have shown that 12-ketoendrin was the main metabolite of endrin in the brain at the time of death. 12-Ketoendrin was found to be 5 times as toxic as endrin and was probably the cause of death in endrin poisoning. However, in 4 orders of birds that had received extensive exposure to or were killed by endrin, no 12-ketoendrin was found. None of this metabolite was present in hens and very little could be detected in rabbits and cows. Residue studies on white mice showed more endrin and much less 12-ketoendrin than in rats. 12-Ketoendrin was recoverable from extracts of spiked samples by gel permeation chromatography but not by florisil techniques. It was suggested that residue studies on birds need not be concerned with analyses for 12-ketoendrin unless the test animals had been feeding on rodents killed by endrin. [Paper presented at the 1978 ASTM Avian & Mammalian Wildlife Toxicology Symposium]

80-3143. Savarie, P. J.; Hayes, D. J.; McBride, R. T.; Roberts, J. D. (Denver Wildl. Res. Cent., US Fish & Wildl. Serv., Denver, CO 80225) **Efficacy and safety of diphacinone as a predacide.** *ASTM STP 693* pp. 69-79; 1978 (20 references).

The use of diphacinone as a predacide was evaluated in acute oral toxicity tests on captive and free-ranging coyotes, in tissue residues from coyotes killed by diphacinone, and in secondary toxicity tests where diphacinone meat baits were fed to male albino Norway rats and golden eagles. High individual variation in coyote response to oral treatment with diphacinone was observed. One male captive coyote survived a diphacinone dose of 1.25 mg/kg and one male free-ranging coyote survived a 2.5 mg/kg dose. Time to death did not vary significantly between the 2 groups, and ranged from 6 to 17 days. When rats were fed meat from captive coyotes killed with diphacinone (0.5 ppm in muscle), a 50% mortality resulted. Residues of diphacinone in coyote small intestine, liver, or kidney were greater than 0.5 ppm. The mean LD50 for diphacinone in captive coyotes was 0.6 mg/kg. Golden eagles kept on a diet of sheep meat containing 2.7 ppm diphacinone for 5 or 10 days showed various signs of toxicity, but no mortality occurred. [Paper presented at the 1978 ASTM Avian Mammalian Wildlife Toxicology Symposium]

80-3144. Lee, S. H.; Brodie, A. F. (Dep. Biochem., Sch. Med., Univ. South. California, Los Angeles, CA 90033) **Vitamin K-dependent carboxylation with ribosomes from *Escherichia coli*.** *Biochem. Biophys. Res. Commun.* 95(2): 499-506; 1980 (16 references).

Vitamin K-dependent incorporation of added $H^{14}CO_3$ was observed *in vitro* in crude ribosomal preparation obtained from *Escherichia coli*. Irradiation of the cells with light at 360 nm during growth enhanced carboxylation activity by approximately 2-fold in the presence of vitamin K_1. In the absence of vitamin K_1 carboxylation activity was lower in irradiated cells than in non-irradiated cells. UV irradiation was previously shown to destroy natural menaquinone; together with present findings this suggests that the UV light grown cells contain an endogenous substrate for the carboxylation reaction. The vitamin K-dependent carboxylation reaction in *E. coli* was found to require NADH and an ATP generating system and was inhibited by warfarin. Warfarin at a concentration near 10 m*M* inhibited endogenous protein carboxylation almost completely. Formation of α-carboxyglutamic acid (Gla) as a carboxylation product was confirmed by measuring labeled Gla in the endogenous protein. Proteins containing Gla are involved in calcium metabolism. The significant of this reaction *E. coli* is unknown.

80-3145. Thithapandha, A. (Dep. Pharmacol., Fac. Sci., Mahidol Univ., Bangkok, Thailand) **Characteristics of drugs that penetrate the preimplantation blastocyst.** *Biochem. Pharmacol.* 29(12): 1663-1668; 1980 (27 references).

Factors which are important in the transfer of drugs into the preimplantation blastocyst of 6-day old rabbits following oral or parenteral administration were identified. One of the compounds studies was DDT; test compounds were radiolabeled with ^{14}C or ^{3}H. Compounds with molecular weights below 585 readily traversed the blastocyst. The blastocyst was relatively impermeable for compounds with molecular weights greater than 5000. No correlation was noted between the blastocyst/plasma radioactivity ratio and the degree of protein binding of the drugs. The degree of ionization and the lipid solubility of the compounds were seen to be important factors in determining the rate of penetration of the compound into the preimplantation blastocysts. A variety of foreign compounds can enter the blastocyst during the preimplantation stages of gestation, according to these findings. The rates of penetration for these compounds are governed by the possible interactions among their physicochemical properties. The ratio of ^{14}C-DDT in rabbit blastocysts to ^{14}C-DDT in plasma never exceeded 0.24 (ratio at 1 hr). The 6 and 12 hr ratios were 0.12 and 0.13, respectively.

80-3146. McLeese, D. W.; Metcalfe, C. D.; Pezzack, D. S. (Fish. & Environ. Sci., Dep. Fish & Oceans, Biol. Stn., St. Andrews, New Brunswick EOG-2X0, Canada) **Bioaccumulation of chlorobiphenyls and endrin from food by lobsters *(Homarus americanus)*.** *Bull. Environ. Contam. Toxicol.* 25(2): 161-168; 1980 (18 references).

The rates of dietary accumulation and clearance of 2 chlorobiphenyls and endrin in lobsters fed contaminated mussels were investigated. The chlorobiphenyls used were 2,2′,4,5′-tetrachlorobiphenyl (TPCB) and 2,2′,4,4′,5,5′-hexachlorobiphenyl (HPCB). Endrin had a lower uptake rate constant than either of the chlorobiphenyls.

HPCB had a much lower excretion rate constant than the other compounds. Thus the accumulation coefficient for HPCB was considerably higher. HPCB concentrations reached equilibrium at 49/mg/g after 65 wk, which was longer than the other compounds. The uptake efficiency for TPCB and HPCB decreased with increasing dietary dosing. The chemicals were accumulated to a greater degree in the lobster hepatopancreas than in the tail or claw muscle. The lower concentrations in the muscle may be related to the lower lipid content of the muscle and to the role of the hepatopancreas in food incorporation.

80-3147. Emran, A.; Shanbaky, N. M.; Borowitz, J. L. (Dep. Pharmacol. & Toxicol., Sch. Pharm. & Pharm. Sci., Purdue Univ., West Lafayette, IN 47907) **Blockade of adrenal catecholamine release by chlordimeform and its metabolites.** *Bull. Environ. Contam. Toxicol.* 25(2): 197-202; 1980 (13 references).

The inhibitory effects of chlordimeform and its metabolites on catecholamine release from isolated bovine adrenals were investigated. Metabolites studied included demethylchlordimeform- HCl, and didemethylchlordimeform- HCl. The study demonstrated that acetylcholine-evoked catecholamine release was inhibited by exposure to the pesticide and its metabolites. The effectiveness in isolated adrenals was similar to toxicity of these chemicals in rats and mice. These findings suggest that a local anesthetic action is important in the systemic toxicity of chlordimeform and certain of its metabolites.

80-3148. Van Hoof, F. (I.V. Antwerpse Waterwerken N.V., 2000 Antwerp, Belgium) **Evaluation of an automatic system for detection of toxic substances in surface water using trout.** *Bull. Environ. Contam. Toxicol.* 25(2): 221-225; 1980 (10 references).

Avoidance reactions, loss of condition or death of trout were measured in response to exposure to toxicants at different concentrations. The toxicants studied included potassium cyanide (KCN), carbaryl, malathion, dinitro-*o*-cresol (DNOC), captan, parathion, cadmium sulfate, and zinc chloride. For cadmium, zinc and parathion no conclusive evidence of reaction was noted. For only one product, KCN, was a response obtained which could be listed as avoidance or loss of condition. Results of this study were compared with results obtained using other monitoring systems. It was concluded that in most cases the monitoring of opercular rhythms is a more sensitive parameter than monitoring the loss of positive rheotaxis. Positive rheotaxis monitoring for cyanides, carbaryl and copper offers sensitivity almost as good as that obtained through opercular rhythm monitoring. In cases such as cadmium and parathion where the flow-through monitors do not give satisfactory results, opercular rhythm monitoring and daphnia mobility inhibition can be used. For the substances tested in this report bacterial oxygen consumption and algal oxygen production using the test organisms described offer no additional advantages over biomonitoring with fish.

80-3149. Quarles, J. M.; Norman, J. O.; Kubena, L. F. (Dep. Med. Microbiol. & Immunol., Coll. Med., Texas A&M Univ., College Station, TX 77843) **Absence of transformation of diflubenzuron in a host-mediated transplacental carcinogen assay.** *Bull. Environ. Contam. Toxicol.* 25(2): 252-256; 1980 (9 references).

A transplacental transformation assay was used to investigate possible transformation of mammalian cells in culture by diflubenzuron. Animals were injected ip with diflubenzuron at concentrations of 1.0, 20.0 or 50.0 mg/100 g body wt. Diflubenzuron did not induce morphological transformations and it did not affect the ability to grow in 0.3% agar. A negative response to these 2 tests indicates that diflubenzuron is not likely to be a moderate or a strong carcinogen. A comparison of these results is made to results obtained with known carcinogens.

80-3150. Mishra, S. K.; Koury, M.; Desaiah, D. (Neurol. & Res. Serv., VA Med. Cent., Jackson, MS 39216) **Inhibition of calcium ATPase activity in rat brain and muscle by chlordecone.** *Bull. Environ. Contam. Toxicol.* 25(2): 262-268; 1980 (23 references).

Male Sprague-Dawley rats were treated orally with chlordecone dissolved in corn oil. Animals received 0, 10 and 25 mg/kg/day for 3 days or 50 mg/kg/day for 2 days. Animals were sacrificed 36 hr after the last dosing. Rats treated with chlordecone at all levels of concentration demonstrated less weight gain than controls. Chlordecone inhibited Ca^{2+} and Mg^{2+}-ATPase activities in a dose-dependent manner. Brain enzymes were also inhibited by chlordecone, reaching a maximum inhibition of 75% at the highest concentration tested. While chlordecone inhibited Ca^{2+}-ATPase *in vitro*, no such inhibition occurred in *in vivo* testing. It is suggested that this discrepancy may have arisen due to a limited treatment period. However, if chlordecone has no effect on Ca^{2+}-ATPase activity *in vivo*, it is suggested that its main effect may be via the mitochondrial energy metabolism.

80-3151. Rani, M. V. U.; Reddi, O. S.; Reddy, P. P. (Dep. Genet. & Inst. Genet., Osmania Univ., Hyderabad 500007, India) **Mutagenicity studies involving aldrin, endosulfan, dimethoate, phosphamidon, carbaryl and Ceresan.** *Bull. Environ. Contam. Toxicol.* 25(2): 277-282; 1980 (24 references).

Mice were exposed to either 146 mg/kg carbaryl, 51.7 mg/kg dimethoate, 5 mg/kg phosphamidon, 13 mg/kg aldrin, 43.3 mg/kg endosulfan, or 10 mg/kg Ceresan (methylmercury chloride), contained in their

drinking water. Six hr after dosing, air-dried smears of the bone marrow were prepared. From each animal 2000 polychromatic erythrocytes and the corresponding number of normochromatic erythrocytes were enumerated. A significant increase was noted in the frequency of polychromatic erythrocytes with micronuclei in mice receiving organophosphorus insecticides (dimethoate and phosphamidon). The frequency was 0.28% in controls, while the corresponding numbers were 0.85 and 0.90% in dimethoate and phosphamidon treated groups, respectively. No significant increases in the frequency of micronuclei was noted in organochlorine (aldrin and endosulfan) treated animals. The incidence of reverse mutation frequency was taken as the criterion for assessing mutagenicity. There was significant increase in the reversion frequencies in dimethoate and phosphamidon treated mice. The metabolites of organophosphorus insecticides were shown to be mutagenic to microorganisms. It was determined that mammalian metabolism is not able to detoxify the insecticides.

80-3152. Fytizas, R. (Benaki Phytopathol. Inst., Kiphissia-Athens, Greece) **Toxicity of paraquat to three marine organisms.** *Bull. Environ. Contam. Toxicol.* 25(2): 283-288; 1980 (8 references).

The effects of paraquat on 3 species of marine animals; the gastropod mollusc *Murex brandaris*, the crustacean *Pagurus* sp., and the bony fish *Mugil cephalus*, were investigated. Fish exposed at 10 ppm died within 1 hr, while the median lethal dose for the crustacean and the gasteropod was 36 and 24 hr, respectively. The crustacean was the least sensitive and the fish was the most sensitive organism in this test at high concentrations. At low concentrations the inverse was true. Paraquat was found at higher concentrations in the digestive tube and skin of fish with lower amounts in the muscles. The crustaceans accumulated more paraquat than the other 2 species. Since the concentrations causing mortality in this study are rarely met in the environment, it was concluded that the toxicity of paraquat must be regarded as moderate. It was also concluded that the respiratory system was the system most affected by the chemical.

80-3153. Walton, B. T. (Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Influence of route of entry on toxicity of polycyclic aromatic hydrocarbons to the cricket *(Acheta domesticus).*** *Bull. Environ. Contam. Toxicol.* 25(2): 289-293; 1980 (5 references).

Acute and chronic toxicity of 5 polycyclic aromatic hydrocarbons (PAHs) [naphthalene, anthracene, benz(a)anthracene, pyrene, and benzo(a)pyrene] and an oxygenated PAH derivative, anthrone, were determined in *Acheta domesticus* (L.). The chemosterilant hexamethylphosphoric triamide (hempa) was also used in the chronic tests. Chronic ingestion of the PAHs caused significantly higher mortality than that experienced in controls. PAHs found in food on substrates contacted by nontarget, litter-dwelling, omnivorous insects, such as crickets, can enter these organisms by uptake from the gastrointestinal tract as well as by movement across the integument. Hempa and naphthalene were more toxic when ingested than when applied topically. Anthrone proved to be non-toxic in food and was not tested for chronic dermal toxicity.

80-3154. Yakushko, V. E.; Rodionov, G. A.; Nadmajteni, L.; Ovsyannikova, L. M. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Min. Public Health, Kiev, USSR) **Biokhimicheskie i morfologicheskie izmeneniya v tkanyakh legkikh i pecheni belykh krys pri eksperimentalvnoi intoksikatsii parakvatom. [Biochemical and morphological changes in lung and liver tissues of white rats in experimental paraquat poisoning.]** *Byull. Eksp. Biol. Med.* 90(8): 146-149; 1980 (13 references) (Russian).

Lung and liver tissues of white rats were exposed to paraquat. Superoxide dismutase (SOD) activity was decreased in lung and liver samples and the number of free radicals increased. After repeated administration of paraquat the inhibition of SOD activity was greater. Evidence of dystrophic and proliferative histomorphological changes was present which was characteristic of exposure to paraquat. Vascular permeability was disturbed. It is suggested that the toxicity of paraquat results from the decrease in SOD activity and the increased numbers of free radicals available.

80-3155. Zavanella, T.; Zaffaroni, N. P.; Arias, E. (Inst. Zool., Univ. Milan, I-20133 Milan, Italy) **Testing of the fungicide maneb for carcinogenicity in two populations of the European crested newt.** *Cancer Lett.* 10(2): 109-116; 1980 (23 references).

Tests were performed to determine the carcinogenicity of maneb in newts. Two populations of wild-collected newts were divided into control and experimental groups. Test animals were exposed to 5 ppm (0.05 of the 16 hr LC50 for females and of the 11 hr LC50 for males) maneb in 30 gal (~ 113 *l*) aquaria. After 37-39 wk, surviving animals were killed and examined histologically and the incidence of melanoma was determined. No differences in tumor frequencies occurred among experimental and control groups of either population. Tumor incidence was 94% in the control groups and 98% in the maneb treated group.

80-3156. Ogata, M.; Hasegawa, T. (Dep. Public Health, Med. Sch., Okayama Univ., Okayama 700, Japan) **The effect of paraquat on the mitochondrial energy transfer**

reaction. *Cell Struct. Function* 3(4): 325-330; 1978 (18 references).

Studies were performed to determine the effects of paraquat on the energy transfer of rat liver mitochondria. Male rats were sacrificed and the liver mitochondria were isolated. These were incubated with sodium succinate, ADP and DNP. Latent ATPase activity, oxygen uptake, the respiratory control index and the ADP to O ratio were determined. Paraquat was added in concentrations up to 1000 μM. A concentration of 100 μM paraquat stimulated respiration (state 4), and decreased the respiratory control index by 30%. It was not apparent that the mitochondrial membranes were injured since K^+ was not released nor was latent ATPase activity affected. It is believed that the paraquat is reduced to a super-oxide which then reacts with cellular components which destroys the cells.

80-3157. Gee, J. B. L. (Sch. Med., Yale Univ., New Haven, CT 06510) **Cellular mechanisms in occupational lung disease.** *Chest* 78(2): 384-387; 1980 (9 references).

Cellular functions in the lung are briefly reviewed. Possible mechanisms involved in the changes occurring in the lung during various occupational diseases are discussed. There may be a component of oxidant damage by the polymorphonuclear leukocytes in occupational lung diseases which are characterized by fever and a pulmonary edema pattern on the chest X-ray. The lung damage caused by the herbicide paraquat is suggested to be caused by the formation of oxidizing free radicals.

80-3158. Reuber, M. D. (Frederick Cancer Res. Cent., NCI, Frederick, MD 21701) **Carcinogenicity of chlorobenzilate in mice, rats, and dogs.** *Clin. Toxicol.* 16(1): 67-98; 1980 (28 references).

Chlorobenzilate is carcinogenic in rats and mice. Malignant neoplasms at all sites were increased in chlorobenzilate-treated male and female rats. There were highly significant incidences of neoplasms of the liver in female rats. Endocrine neoplasms, particularly of the thyroid gland in male rats and the pituitary in female rats, were also increased. Unusual neoplasms, such as Kupffer cell sarcomas of the liver, were present in chlorobenzilate-treated rats and not in control rats. Chlorobenzilate induced malignant neoplasms of the liver in male and female mice and neoplasms of the stomach in female mice. The incidence of malignant neoplasms at all sites was also increased. Neoplasms other than the stomach were adenocarcinomas of the lung and reticulum cell sarcomas. Atrophy of the testes was strikingly increased in mice and rats receiving chlorobenzilate. The lesion interferes with the health of the animals and with the development of neoplasms. In addition, rats and mice sometimes had thromboses. Chlorobenzilate was toxic to dogs over a 2-yr period. Nodules in the thyroid suggest that dogs might have developed carcinomas of the thyroid had chlorobenzilate been administered for a longer time. Dogs developed cardiac changes, such as ventricular hypertrophy, A-V block, or extraventricular systoles, as well as arteriosclerosis of the pulmonary artery. (Author abstract by permission)

80-3159. Alcorn, E. E.; Hughes, J. H. (Dep. Emerg. Serv., Univ. Hosp., Health Sci. Cent., Univ. Arizona, Tuscon, AZ 85724) **Airway irritation from carbamyl *(sic).*** *Clin. Toxicol.* 16(3): 297-298; 1980 (4 references).

A 49-yr-old man was admitted for emergency treatment following the dusting of chickens with carbamyl (designated as a carbamate insecticide, but not further identified; probably carbaryl). While dusting the chickens for lice early in the day he experienced coughing and strangling, which stopped after he left the treatment area, showered and gargled. He resumed treatment in the afternoon, then developed acute respiratory distress. He was given oxygen by mask while being transported to the hospital. On arrival he was mildly diaphoretic, coughing violently, and had elevated pulse, blood pressure and respiration rate. The electrocardiogam revealed sinus tachycardia. Chest radiogram and auscultation was normal. Administration of atropine at 1.0 mg im increased the pulse rate from 116 to 124. Serum and RBC cholinesterase levels were normal. The patient was discharged, greatly improved, on the following day. The symptoms seemed mainly to represent local laryngeal and upper airway irritation.

80-3160. Ghiasuddin, S. M.; Matsumura, F. (Pestic. Res. Cent., Michigan State Univ., East Lansing, MI 48842) **Ca^{2+} regulation by Ca-ATPase in relation to DDT's action on the lobster nerve.** *Comp. Biochem. Physiol. C* 64(1): 29-36; 1979 (27 references).

The role of an ecto-ATPase in the nerve cord of the walking leg of the American lobster, *Homarus americanus*, was studied by using DDT as a specific inhibitor of this enzyme. By using isolated nerve cords, the rates of $^{45}Ca^{2+}$ uptake and release by the intact nerves were studied. Though the bulk (approximately 80%) of the Ca^{2+} efflux and influx was found to be due to the exchange of ions between the external medium and the extracellular space in the nerve cord, the remaining portion of Ca^{2+} exchange is due to processes involving the nerve cells. By using a suspended cell preparation, it was determined that at least a portion of the ATP-dependent Ca^{2+} exchange is carried out by an ecto Ca-ATPase. The role of this enzyme appears to maintain a proper level of surface Ca^{2+} in the nerve membrane. Inhibition of this Ca-ATPase by DDT explains why DDT-poisoned axons are unstable and prone to excitation, since axons which lack Ca^{2+} are known to exhibit the same characteristics. (Author abstract by permission)

80-3161. Reiner, E.; Simeon, V.; Skrinjaric-Spoljar, M. (Inst. Med. Res. & Occup. Health, Zagreb, Yugoslavia)

Hydrolysis of *O,O*-dimethyl-2, 2-dichlorovinyl phosphate (DDVP) by esterases in parasitic helminths, and in vertebrate plasma and erythrocytes. *Comp. Biochem. Physiol. C* 66(2): 149-152; 1980 (20 references).

The hydrolysis of DDVP (dichlorvos; *O,O*-dimethyl-2, 2-dichlorovinyl phosphate, E600 (parathion; *O,O*-diethyl-4- nitrophenyl phosphate) and MeE600 (methyl parathion; *O,O*-dimethyl-4- nitrophenyl phosphate) was measured in homogenates of some parasitic helminths, and in plasma and liver of some vertebrates. The proteins which hydrolyzed DDVP in all studied preparation can be classified under arylesterases (E.C.3.1.1.2). (Author abstract by permission)

80-3162. Pekas, J. C. (Metab. & Radiat. Res. Lab., USDA, Fargo, ND) **Gastrointestinal metabolism and transport of pesticidal carbamates.** *CRC Crit. Rev. Toxicol.* 7(1): 37-101; 1980 (177 references).

The behavior of ingested pesticidal carbamates in the gastrointestinal tract is reviewed. Information is given concerning effects on functions of the gastrointestinal tissues as well as the metabolism and absorption of the parent carbamates or their metabolites by the gastrointestinal tract. The biological activity, including pesticidal activity, of carbamates is discussed, including the relationship between pest and mammalian toxicities and the role of the gastrointestinal tract in modifying this differential toxicity. Also considered are the effects of carbamates on gastrointestinal functions such as gastrointestinal motility and gastrointestinal secretions. *In vivo* and *in vitro* studies designed to elucidate this gastrointestinal metabolism of pesticidal carbamates are summarized, with the structures and properties of metabolites elaborated upon. Research on absorption is also considered in detail. *In vivo* studies have shown that pesticidal carbamates are absorbed nearly completely during normal transit through the gastrointestinal tract, but the mechanism of absorption is not known. A hypothetical model is proposed to explain carbamate absorption after natural ingestion of contaminated natural foodstuffs.

80-3163. Yoo, R. S. (Univ. California, Davis, CA 95616) **Characterization of algal growth and phytoplankton succession in response to thiocarbamate herbicides with particular emphasis on benthiocarb *S*-(4-chlorobenzyl) *N,N*-diethylthiocarbamate.** *Diss. Abstr. Int. B* 41(2): 445-446; 1980.

The effects of benthiocarb on the growth, survival and succession of algae were investigated in order to better understand the interaction of a thiocarbamate herbicide and the primary producers of an aquatic ecosystem. The growth of *Chlorella pyrenoidosa* in batch culture was inhibited by benthiocarb at concentrations which might develop in a flooded rice field, as low as 0.01 ppm, but not by napropamide up to 20.0 ppm. Batch culture bioassays were more sensitive than continuous culture bioassays in evaluating the toxicity of benthiocarb to *Chlorella*. In continuous culture the algae achieved a new steady state at greatly reduced population densities. The natural phytoplankton assemblages of flooded rice fields in Butte County, California, were sampled after treatment with benthiocarb or molinate to determine species composition and total algal population density. The total phytoplankton in treated fields did not increase significantly during the first week after treatment, while untreated fields showed an approximately 65% increase. Members of the phylum Chlorophyta underwent the greatest reduction in numbers. Individual and total phytoplankton population densities usually recovered to control levels by the second week after herbicide treatment. No long term effects on phytoplankton species composition were detected. In laboratories, the toxicity of benthiocarb sulfone to *Scenedesmus longus* and *Cosmarium botrytis* was investigated using batch culture systems. Benthiocarb was ten times more toxic to *Scenedesmus* than to *Cosmarium*, but benthiocarb sulfone was more toxic to *Cosmarium*. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8016794)

80-3164. Orndorff, S. A. (Univ. Maryland, College Park, MD) **The ecological and physiological effects of Kepone on marine bacteria and biotransformation of Kepone.** *Diss. Abstr. Int. B* 41(2): 471-472; 1980.

The distribution, identification, and degradative potential of Kepone (chlordecone)-resistant (Kepone^r) and Kepone-sensitive (Kepone^s) bacteria in the James River and Chesapeake Bay were examined. The effects of Kepone on microbial activity *in situ* and on the physiology of selected estuarine bacterial isolates were also studied. Results of a field survey carried out over a 2 yr period showed that the number and types, of Kepone^r bacteria present in a given environment reflected the degree of anthropogenic contamination, as well as the major indigenous Gram-negative genera of the sampling sites. Only Gram-negative bacteria, predominantly *Pseudomonas* spp., *Vibrio* spp. and *Aeromonas hydrophila*, were found to be resistant to $\geq$ 10 mg Kepone/l, whereas *Bacillus* spp. and *Corynebacterium* spp. were observed to be sensitive to $\leq$ 1 mg Kepone/l. From cluster analysis of 36 coded traits, it was found that strains of *Pseudomonas* spp. clustering at the 70% similarity level and comprising the majority of the Kepone^r bacteria were resistant to pesticides and heavy metals, degraded oil, reduced nitrate, and were Gram-negative, oxidase-positive, and catalase positive. *Pseudomonas aeruginosa* strain K03 and a mixed, aerobic, enrichment culture were shown to dechlorinate Kepone via aerobic cometabolism to yield monohydro-Kepone. The mixed culture also produced a chlordecol-like compound, suggesting synergistic bacterial action on Kepone. Bacteria in James River sediment did not produce significant concentrations of metabolites. Results of physiological studies in-

dicated that exposure of Gram-positive bacteria to Kepone caused disruption of oxidative metabolism and dose-response induced cell death. Growth rates of Gram-negative bacteria were not significantly affected by ≤ 100 μg Kepone/ml except when detergents were added, whereupon otherwise sublethal concentrations of Kepone caused cell death. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8016990.)

80-3165. Zakour, H. R. (Rice Univ., Houston, TX 77001) **Toxicity, uptake and metabolism of the *N*-methylcarbamate pesticide carbofuran by the freshwater bivalve mollusc *Glebula rotundata* (Lamarck).** *Diss. Abstr. Int. B* 41(2): 493; 1980.

The uptake, toxicity and metabolism of the *N*-methylcarbamate pesticide carbofuran by the nontarget freshwater bivalve mollusc *Glebula rotundata* (Lamarck) were examined. Uptake and toxicity studies were also conducted with another bivalve species, *Rangia cuneata* (Lea). Both *G. rotundata* and *R. cuneata* absorbed water-borne carbofuran. During long-term (> 48 hr) exposure experiments, *R. cuneata* did not appreciably concentrate this pesticide; generally, tissue and water concentrations of carbofuran were almost equivalent. In short-term (< 48 hr) exposure studies, carbofuran uptake by *G. rotundata* was proportional to the wet wt of whole body tissue. *G. rotundata* tissues did not differentially absorb this pesticide. When exposed to carbofuran concentrations > 75 ppm (waterborne or injected), both species exhibited symptoms of carbofuran poisoning; these included gaping of the shell valves, extension and flaccidity of the foot, incoordination and loss of tactile response. The effects of carbofuran were reversible except in *R. cuneata* that had lost the ability to respond to tactile stimulation. In *in vivo* experiments *G. rotundata* converted radiolabeled carbofuran primarily to polar compounds; a variety of less abundant free metabolites were also recovered. The polar metabolites produced by water immersion exposed clams raised the possibility of involvement of an amino acid. *G. rotundata* degraded carbofuran more slowly than did most other animals but more rapidly than plants and microorganisms. *G. rotundata* hemolymph metabolized carbofuran more rapidly than other organ homogenates. The bacterial contribution to the observed metabolism of carbofuran by *G. rotundata* appeared to be negligible in both *in vitro* and *in vivo* studies. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8018094.)

80-3166. Willhite, C. C. (Dartmouth Coll., Hanover, NH 03755) **Studies on the basis of the toxicity of aliphatic organonitriles.** *Diss. Abstr. Int. B* 41(2): 536-537; 1980.

Aliphatic organonitriles are commercially important as chemical intermediates and agricultural insecticides. Some 30,000 persons are potentially exposed daily to organonitriles, and fatalities have occurred. Addition of high concentrations of acetonitrile, propionitrile, acrylonitrile, *n*-butyronitrile, malononitrile, or succionitrile failed to alter the *in vitro* activity of purified bovine cardiac cytochrome *c* oxidase. Acetone cyanohydrin inhibited the enzyme in a manner kinetically similar to KCN. Treatment of male CD-1 mice with multiple ip doses of sodium thiosulfate provided almost complete protection against a lethal ip dose of the organonitriles. Treatment of mice with multiple ip doses of sodium nitrite provided significant protection against poisoning by acrylonitrile, *n*-butyronitrile, acetone cyanohydrin, or malononitrile. Pretreatment of mice with carbon tetrachloride completely protected mice against a lethal ip dose of all of the nitriles except acetone cyanohydrin. Nanomolar concentrations of hydrogen cyanide were detected in the tissues of mice after an ip LD50 dose of the nitriles. Significant decreases in the *in situ* HCN concentrations were observed in the tissues following sodium thiosulfate prophylaxis. The results suggest that there is little acute toxicity associated with the parent compounds; deaths of individuals acutely poisoned with the aliphatic organonitriles appear due to *in vitro* liberation of HCN, inhibition of *in situ* mitochondrial cytochrome *c* oxidase, and respiratory arrest. Intraperitoneal injection of acrylonitrile or propionitrile on day 8 of gestation in the hamster produced severe axial skeletal malformations in the offspring plus a teratogenic dose of either acrylonitrile or propionitrile revealed mesodermal changes including a reduced number of cells, shrinkage of the cell cytoplasm, pyknotic nuclei, enlarged extracellular spaces, a reduced number of mitotic figures, and necrobiosis. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8017620)

80-3167. Stewart, R. R. (Coll. Environ. Sci. & For., State Univ. New York, Syracuse, NY) **The epoxidation of aldrin in the intestine of the American cockroach *Periplaneta americana* (L) Orthoptera: Blattidae.** *Diss. Abstr. Int. B* 41(3): 812; 1980.

The epoxidation of aldrin in the intestinal tissues of the American cockroach, *Peripleneta americana* (L) was studied to quantify the activity in the various regions of the intestine. In the heterogeneous reaction mixture containing subcellular membrane particles the highly lipophilic substrate was absorbed into lipid phases including the microsomal membranes. The concentration of substrate in these lipid phases seemed to determine the enzyme activity. The proper concentrations of enzyme and substrate were then determined to quantitatively assay the intestinal tissues. It was found that crop, anterior midgut and posterior midgut regions of the intestine along with the activity of the Malpighian tubules contained the bulk of the activity. Taking the size of each tissue into account the crop activity was substantial. Histological studies of the crop show that the cells contain the infolded plasma membrane

characteristic of absorbing cells with the smooth endoplasmic reticulum, the site of microsomal oxidases, closely aligned along the plasma membrane. Smooth endoplasmic reticulum was also found in association with lipid drops in the crop epithelial cells. The importance of these structures was evidenced by finding that aldrin was rapidly absorbed in the crop. The aldrin epoxidase activity in the anterior and posterior regions of the midgut varies depending on the presence of dietary inducers. Under conditions of low dietary inducers the anterior midgut had higher epoxidase activity, but in the presence of inducers whether secondary plant substances or more classical inducers the activity in the midgut surpassed that of the anterior region. These findings indicate that insect intestinal tissues respond to the presence of dietary xenobiotics in the same fashion as the intestinal tissues of mammals. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8019084)

80-3168. Marsden, P. J. (Univ. California, Riverside, CA) **Metabolism and toxicity of 2,3-dihydro-2,2-dimethyl-7-benzofuranyl(di- *N*-butylaminosulfenyl) (methyl)carbamate in rats and houseflies.** *Diss. Abstr. Int. B* 41(3): 971; 1980.

The toxicity of 2,3-dihydro-2,2-dimethyl-7-benzofuranyl(di- *N*-butylaminosulfenyl) (methyl) carbamate (DBSC; a degradation product of carbofuran) was investigated against the rat and the housefly. The metabolic fate of DBSC in the rat was emphasized in this study. No significant differences in the metabolism of DBSC were found for male and female rats. Experiments with carbonyl-labeled DBSC showed that 30-45% of the applied dose was recovered as [^{14}C]CO_2. Animals treated with 30 mg/kg of DBSC hydrolyzed less of the applied dose of CO_2 than did animals treated with 3 mg/kg. Experiments with ring-labeled DBSC showed that 70-90% of the applied dose was excreted via the urine. Experiments with dibutyl-labeled DBSC showed that 90% of the radioactivity in the urine was unconjugated dibutylamine. The feces of rats treated with dibutyl-labeled DBSC contained SO_2-DBSC and a sulfone urea. The sulfone species accounted for 20-30% of the applied dose. Three hr following oral administration of DBSC significant amounts of the compound were found bound to blood proteins. The slow administration of carbamate insecticides into an animal allows the recovery of inhibited AChE. The slow release of DBSC from the blood into the rest of the body was postulated as the primary reason for the low mammalian toxicity of DBSC. Detoxification of DBSC to sulfone species also contributed to its low mammalian toxicity. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8020613)

80-3169. Vos, J. G.; von Logten, M. J.; Kreeftenberg, J. G.; Steerenberg, P. A.; Kruizinga, W. (Natl. Inst. Public Health, Bilthoven, The Netherlands) **Effect of hexachlorobenzene on the immune system of rats following combined pre- and postnatal exposure.** *Drug Chem. Toxicol.* 2(1-2): 61-76; 1979 (20 references).

The effect of hexachlorobenzene (HCB) on the immune system was studied in rats subjected to both pre- and postnatal exposure. Pregnant Wistar rats were kept on diets containing either 50 or 150 mg HCB/kg throughout pregnancy and during lactation and, after weaning, their offspring were continued on the same HCB exposure regimen as their mothers. Resistance to *Listeria monocytogenes* and *Trichinella spiralis* infection was reduced in both treatment groups. HCB treatment caused no observable effect on allograft rejection or mitogenic response of spleen and thymus cells. Thymus-dependent antibody response to *T. spiralis* antigen was increased by HCB. Secondary IgG titers to tetanus toxoid were elevated 16-fold in both treatment groups. HCB treatment did not affect thymus-independent response to LPS, clearance of carbon particles and *L. monocytogenes*, or passive cutaneous anaphylaxis. Histologic examination of HCB treated rats revealed morphologic changes in lymph nodes, lung, and liver. Hepatic weight increases and microscopic changes were only found in the 150 mg/kg dose group, suggesting that the developing immune system is particularly susceptible to the effects of HCB.

80-3170. Lech, J. J.; Bend, J. R. (Dep. Pharmacol. & Toxicol., Med. Coll. Wisconsin, Milwaukee, WI 53226) **Relationship between biotransformation and the toxicity and fate of xenobiotic chemicals in fish.** *Environ. Health Perspect.* 34: 115-131; 1980 (75 references).

A literature review is presented in which several aspects of the interactions of xenobiotic compounds with fish are discussed. It appears that several biotransformations of xenobiotics have significant effects on the toxicity and bioaccumulation factors for chemicals such as phenoxyacetic acids, some phenolic compounds, several naphthalene formulations, and a large number of organochlorine pesticides. Inhibition of certain biotransformations leads to the increased toxicity of certain compounds. The metabolites of compounds which are biotransformed at higher rates can be transported to the tissues of fish. Polycyclic aromatic hydrocarbons and crude oil have been shown to induce microsomal mixed-function oxidases. The results of the action of these enzymes is the altered metabolism of xenobiotics.

80-3171. Olson, D. L.; Christensen, G. M. (Environ. Res. Lab., US EPA, Duluth, MN 55804) **Effects of water pollutants and other chemicals on fish acetylcholinesterase *(in vitro).*** *Environ. Res.* 21(2): 327-335; 1980 (30 references).

Acetylcholinesterase (AChE) preparations from the muscle of the fathead minnow (*Pimephales promelas*

Rafinesque) were treated *(in vitro)* with 74 chemicals of various classes, many of which are environmental contaminants, to determine their effect upon enzyme activity. A highly inhibitory effect was found with several carbamates, one organooxyphosphate, arsenite ion, and certain heavy metal cations. Intermediate inhibition was found with the arsenate ion, other metal cations, organometals, certain neuroactive agents, organophosphates, and one organochlorine pesticide. Several organochlorine pesticides, alkaline and alkaline-earth cations, a variety of anions, several drugs, and other chemicals had little inhibitory effect at the highest concentration used (0.01 *M*). The effect of chemicals in mixtures of known composition was approximately additive. None of the chemicals tested caused detectable enzyme activation. (Author abstract reprinted by permission of Academic Press)

80-3172. Vahter, M.; Norin, H. (Dep. Environ. Hyg., Natl. Environ. Prot. Board, Stockholm, Sweden) **Metabolism of ^{74}As-labeled trivalent and pentavalent organic arsenic in mice.** *Environ. Res.* 21(2): 446-457; 1980 (41 references).

Man is exposed to different forms of arsenic in the environment but differences in metabolism and toxicity are poorly understood. The differences in metabolism between pentavalent and trivalent inorganics in mice following single oral administration of ^{74}As-labeled arsenate or arsenite (0.4 and 4 mg As/kg body wt) was studied. Valence state of the administered arsenic was strictly controlled, which has not always been the case in previous studies. In mice given the high dose, whole body retention was two to three times higher after exposure to As(III) compared to As(V). Retention was also dose dependent. Five wk after administration, high dose to low dose retention ratios were 6 and 11 for As(V) and As(III). Differences found in most organs studied (blood, kidney, liver, bile, brain, skeleton, and skin) were most obvious in liver and bile with concentrations 2 to 10 times higher in the As(III) groups. Red cell to plasma ratios were 2-3 for As(III) and close to unity for As(V). It is suggested that the observed differences between As(V) and As(III) are due to differences in degree of methylation and subsequent elimination primarily via the kidneys. (Author abstract reprinted by permission of Academic Press)

80-3173. Giri, S.; Hollinger, M. A.; Schiedt, M. J. (Dep. Physiol. Sci., Sch. Vet. Med. Pharmacol., Sch. Med., Univ. California, Davis, CA 95616) **The effects of ozone and paraquat on $PGF_{2\alpha}$ and PGE_2 levels in plasma and combined pleural effusion and lung lavage of rats.** *Environ. Res.* 21(2): 467-476; 1980 (44 references).

The effects of lung toxins O_3 and paraquat on $PGF_{2\alpha}$ and PGE_2 levels of plasma and combined pleural effusion and lung lavage were studied in male Sprague-Dawley rats using radioimmunoassay. The plasma concentration of $PGF_{2\alpha}$ in rats exposed to 4 ppm O_3 for 2, 4, and 8 hr was increased by 186, 109, and 25%, respectively. The increase in $PGF_{2\alpha}$ level in pleural effusion-lung lavage of these rats at the corresponding times were 82, 0, and 65%. The plasma concentrations of $PGF_{2\alpha}$ and PGE_2 were increased in response to treatment with paraquat (45 mg/kg ip). The increases in plasma $PGF_{2\alpha}$ at 1.5, 3, 6, 12, 24, and 48 hr following paraquat treatment were 223, 128, 47, 270, 195, and 130%, respectively. The increases in plasma concentration of PGE_2 at the corresponding times were 9, 88, 279, 323, 325, and 66%. In view of a dramatic increase in the prostaglandin level of plasma and pleural effusion-lung lavage following exposure to O_3 and treatment with paraquat, it has been suggested that an increased level of prostaglandin in plasma and lung lavage (done in case of O_3) might offer some diagnostic value for the morphological and functional impairment of the lung. (Author abstract reprinted by permission of Academic Press)

80-3174. Wassermann, M.; Bercovici, B.; Cucos, S.; Wassermann, D.; Ron, M. (Dep. Occup. Health, Hadassah Med. Sch., Hebrew Univ., Jerusalem, Israel) **Storage of some organochlorine compounds in toxemia of pregnancy.** *Environ. Res.* 22(2): 404-411; 1980 (11 references).

Nine out of 18 cases of toxemia of pregnancy had high PCB serum levels in comparison with a control group of 12 women with normal pregnancies. Seven out of the 9 high PCB levels cases were multiparae. These findings suggest a role of PCBs in the promotion of toxemia of pregnancy, possibly by depressing the maternal immunological response to fetal antigens. The pattern of the gas chromatogram of PCB's differed in the control and in the low PCB levels toxemia groups, due possibly to differences in some hormonal and/or enzymatic activities. In the high PCB levels toxemia cases, the chromatograms showed high peaks at 8. This fact adds to the quantitative dimension a qualitative one. The DDT/DDE ratios were lowest in the high PCB levels toxemia group suggesting an increased degradation of DDT to DDE and/or a decreased excretion of DDT. (Author abstract by permission of Academic Press)

80-3175. Quader, H.; Filner, P. (DOE Plant Res. Lab., Michigan State Univ., East Lansing, MI) **The action of antimitotic herbicides on flagellar regeneration in *Chlamydomonas reinhardtii*: a comparison with the action of colchicine.** *Eur. J. Cell Biol.* 21(3): 301-304; 1980 (29 references).

Chlamydomonas reinhardtii was used in studies designed to determine the effects of the antimitotic herbicides amiprophos-methyl (APM), trifluralin, and oryzalin on flagellar regeneration. Herbicides at various concentrations were added to either normal or pH-shock

deflagellated cells. Radioactive Ca^{2+} uptake was measured, and the effect of the herbicides on photosynthesis and respiration was estimated by monitoring O_2 evolution or consumption with an oxygen electrode. Data were compared with results of the effects of colchicine. The herbicides blocked flagellar regeneration at 5 μM. When the test compounds were applied to regenerating flagella, colchicine stopped further regeneration, while the herbicides induced gradual shortening of the partially regenerated flagella. The herbicides also showed a concentration- and temperature-dependent shortening of fully developed flagella. The herbicides inhibited photosynthesis, respiration and Ca^{2+} uptake; colchicine did not affect these processes.

80-3176. Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Modification of hepatobiliary function by toxic chemicals.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(8): 2240-2245; 1979 (34 references).

A number of toxic chemicals alter the biliary excretory function of the liver. Despite the demonstration that a diversity of agents modify hepatobiliary function, the mechanism(s) by which these agents manifest this effect is not understood. Modification of hepatobiliary function has been studied in experimental animals after exposure to a number of organochlorine pesticides. Studies with isolated perfused rat livers and whole animal preparations have revealed that mirex- and chlordecone (Kepone)-induced interference with biliary excretory function cannot be accounted for by alterations in the rate of metabolism or the volume of bile secreted. Exposure to these chemicals results in enhanced bile flow. Persistence of failure to excrete preformed, readily excretable metabolites, even in the presence of adequate levels of these metabolites in the liver, suggests impaired transport from the hepatocytes into the bile canaliculi. Among a number of possible mechanisms explaining these results, impaired transport due to mirex- and Kepone-induced interference with energy production and utilization was examined. This hypothesis is consistent with the ability of mirex and Kepone to inhibit hepatic mitochondrial Mg^{2+}-ATPase as well as Na^+,K^+-ATPase activities after *in vivo* exposure. Direct correlations between these enzyme activities and hepatobiliary dysfunction are difficult to obtain. This may be due at least in part to a system of priority invoked at the cellular level for the utilization of energy. If transport of substances across membranes is most vital and hence of highest priority, a direct relationship between impaired function and cellular energetics may not be expected until the latter is compromised to a critical level. (Author abstract by permission)

80-3177. Lijinsky, W.; Reuber, M. D. (Chem. Carcinog. Program, Frederick Cancer Res. Cent., NCI, Frederick, MD 21701) **Tumors induced in Fischer 344 rats by the feeding of disulfiram together with sodium nitrite.** *Food Cosmet. Toxicol.* 18(1): 85-87; 1980 (17 references).

A mixture of 0.1% disulfiram together with 0.2% sodium nitrite in powdered rat diet was fed to 20 male and 20 female Fischer 344 rats for 78 wk, after which the animals were observed until death. Ten of the males and 12 of the females died with tumors of the esophagus, tongue, squamous stomach and nasal cavity. None of these tumors was observed in rats fed either disulfiram or sodium nitrite alone at similar doses. The tumors were attributed to the reaction of disulfiram and nitrite in the stomach, with the formation of nitrosodiethylamine, which has given rise to these tumors in Fischer rats from the same colony. (Author abstract by permission)

80-3178. Theiss, J. C.; Shimkin, M. B. (Sch. Public Health, Univ. Texas, Houston, TX 77025) **Effect of the plant growth regulator, 2-chloroethylphosphonic acid, on spontaneous and chemically-induced lung tumorigenesis in strain A mice.** *Food Cosmet. Toxicol.* 18(2): 129-132; 1980 (11 references).

Both the carcinogenicity and the co-carcinogenicity of the plant growth regulator, 2-chloroethylphosphonic acid (ethephon), were assessed in the strain A mouse pulmonary adenoma bioassay. 2-Chloroethylphosphonic acid suppressed the spontaneous development of lung tumors in strain A mice and inhibited the development of lung tumors in response to urethane, an active carcinogen in the pulmonary adenoma bioassay. At physiological pH, 2-chloroethylphosphonic acid breaks down into ethylene, phosphate and chloride. The ethylene thus generated may be responsible for the anticarcinogenic effects of the plant growth regulator, since this gas has been shown to inhibit both cell division and DNA synthesis in plants. (Author abstract by permission)

80-3179. Mikol, Y. B.; Roux, F.; Decloitre, F.; Fournier, E. P. (Lab. Carcinog. Metab. & Toxicol., Metab. & Nutr. Sect., NCI, Bethesda, MD 20205) **Liver-enzyme induction in lindane- and captan-treated rats.** *Food Cosmet. Toxicol.* 18(4): 377-382; 1980 (19 references).

The effects of lindane and of captan on several liver-enzyme activities involved in the detoxication/activation of foreign chemicals was studied in male rats. The parameters selected were acid phosphatase as a marker of the lysosomal system involved in the cellular response to intoxication, azoreductase and *n*-nitroanisole-*O*-demethylase as detoxication enzymes, and the binding of benzo[*a*]pyrene (BP) and dimethylaminoazobenzene metabolites to DNA as indicators of metabolic activation. The continuous feeding of diet containing 120 ppm lindane for 4 wk induced *O*-demethylase and BP-DNA binding (between two- and three-fold), without affecting the other enzymes. BP-DNA binding was induced by as little as 24

ppm lindane. When lindane was given ip (3 × 20 mg/kg/-day), induction of *O*-demethylase and benzo[*a*]pyrene activation again occurred and there was also a decrease in acid phosphatase. A similar but more pronounced pattern was observed in rats treated with phenobarbital (3 × 80 mg/kg/day). Methylcholanthrene induced the three activities in the decreasing order: BP-DNA binding, *O*-demethylase and acid phosphatase. Ingestion of diet containing 10 or 50 ppm captan for 4 wk did not alter any enzymatic activities. Levels of 3000 or 15,000 ppm led to a significant (four-fold) induction in *O*-demethylase and BP-DNA binding, but did not affect acid phosphatase activity. Thus not only organochlorine pesticides but also others such as the phthalimide, captan, are potent inducers of the mixed-function oxidases. The route of administration, dose and duration of treatment are predominant factors in their effects on the balance of enzymes involved in the detoxication or activation of chemicals. (Author abstract by permission)

80-3180. Shtannikov, E. V.; Stepanova, N. Yu.; Ilyin, I. E.; Eliseev, Yu. Yu. (Med. Inst., Saratov, USSR) **Otdalennye zffekty vliyaniya produktov transformatsii pestitsidov i poverkhostno-aktivnykh veshchestv. [Long term effects of surfactants and transformation products of pesticides.]** *Gig. Sanit.* 45(6): 14-16; 1980 (3 references) (Russian).

The mutagenic activity and embryotoxicity of transformation products of pesticides [DDT, HCCH (BHC), carbophos (malathion), and TCM-3 (trichlorometaphos- 3)] and a surfactant (OP-7) were studied in random-bred albino rats. Pesticides and the surfactant were subjected to degradation by gaseous chlorine and chloramine B, and the products of chlorination were administered ig for 2 mo at 0.2-0.25 LD50. Chlorination resulted in significant increases in toxicity: the values of the LD50s before and after chlorination were 320 and 390 mg/kg for DDT, 230 and 210 mg/kg for HCCH, 450 and 150-375 mg/kg for carbophos, 625 and 550 mg/kg for TCM-3, and 7870 and 4560 mg/kg for OP-7. Chlorination increased the mutagenic activity of pesticides and the surfactant; the yield of chromosome aberrations after treatment with original and chlorinated DDT was 10.1-10.6% and 12.1-12.4%, respectively; the yield of chromosome aberrations after treatment with HCCH and chlorinated HCCH was 6.1-9.3% and 7.7-11.1%, respectively. Chlorinated DDT increased the pre-implantation embryo fatality rate.

80-3181. Shepel'skaya, N. R. (All-Union Res. Inst. Hyg. & Toxicol. Polymers Pestic. & Plastic., Kiev, USSR) **Gonadotoksicheskii zffekt valeksona v zksperimente na zhivotnykh. [Gonadotoxicity of Valexon in experiments in animals.]** *Gig. Sanit.* 45(7): 77; 1980 (4 references) (Russian).

Gonadotoxicity of the insecticide Valexon (phoxim) was studied in albino rats. Animals were subjected to daily ig administrations of Valexon for 10 wk at 0.7 mg/kg (~0.0007 LD50). Valexon administration induced marked morphological changes in the testes, while the functional and morphological state of the ovaries in exposed females was similar to that in control females. Post-implantation embryo fatalities in intact females mated with exposed males was 25%.

80-3182. Okahata, S. (Dep. Pediatr., Sch. Med., Hiroshima Univ., Hiroshima 734, Japan) **Mechanism of methyl viologen induced hemolysis.** *Hiroshima J. Med. Sci.* 29(2): 49-54; 1980 (28 references).

Human erythrocytes were used to study the toxicity of a hemolytic compound, paraquat, as well as the peroxide radical and its products, along with the mode of protection by superoxide dismutase at the cellular level. Erythrocytes were washed and suspended in isotonic saline solution. Hemolysis occurred in the presence of 1 m*M* paraquat in 103 m*M* NaCl solution. This hemolysis was inhibited by externally added superoxide dismutase (SOD) and histidine, a scavenger of singlet oxygen, but not by catalase or by methionine, a scavenger of hydroxyl radical. The addition of SOD inhibitors to erythrocyte suspending medium resulted in marked prevention of paraquat induced hemolysis. Hemoglobin from erythrocytes treated with paraquat showed a decrease in spectral absorbance of 576 nm (disappearance of oxyhemoglobin) and an increase at 620 nm. Addition of SOD to the suspending medium inhibited this breakdown, while catalase did not. These findings contrasted with previous studies and indicated that intracellular SOD is conducive to hemolysis, while extracellular SOD is protective against hemolysis. The possibility is advanced that the overall acceleration of the dismutation reaction and paraquat redox cycle by SOD results in larger amounts of superoxide ion and hydrogen peroxide being available and reacting to form a more toxic agent such as singlet oxygen.

80-3183. Roisch, U.; Lingens, F. (Inst. Mikrobiol., Univ. Hohenheim, D-7000 Stuttgart 70, BRD) **Zum wirkungsmechanismus des herbizids *N*-(phosphonomethyl) glycin: einfluss von *N*-(phosphonomethyl) glycin auf das wachstum und auf die enzyme der aromatenbiosynthese von *Escherichia coli*. [The mechanism of action of the herbicide *N*-(phosphonomethyl) glycine: its effect on the growth of the enzymes of aromatic amino acid biosynthesis in *Escherichia coli*.]** *Hoppe-Seyler's Z. Physiol. Chem.* 361(7): 1049-1058; 1980 (39 references) (German).

Studies were performed that demonstrated the effects of *N*-(phosphonomethyl) glycine (glyphosate) on *Escherichia coli*. The lag phase was prolonged and the growth was inhibited. The inhibition was most obvious when the compound was added before inoculation. The ad-

dition of a mixture of phenylalanine, tyrosine and tryptophan completely negated the inhibitory effect. The addition of Co^{2+} stops the inhibition of the production of the enzymes phospho-2-oxo-3-deoxyheptonate aldolase and 3-dehydroquinate synthase. The addition of Mg^{2+} negates the inhibition of anthranilate synthase by the pesticide. Cells grown in minimal medium are subject to the repression of phospho-2-oxo-3-deoxyheptonate aldolase by glyphosate. Several other enzymes showed slight or no repression by the pesticide.

80-3184. Venkateswerlu, G.; Sastry, K. S. (Dep. Biochem., Osmania Univ., Hyderbad 500007, India) **Studies on copper toxicity in *Neurospora crassa*.** *Indian J. Biochem. Biophys.* 16(2): 84-87; 1979 (21 references).

Neurospora crassa Em 5297a (wild strain) was used to study the toxicity of copper on sole nitrate medium (ammonium nitrate as sole nitrogen source) and on a normal nitrogen medium (containing ammonium tartrate and ammonium nitrate). Copper toxicity toward *N. crassa* was greater on the sole nitrate than on the normal nitrogen medium. Copper toxicity was counteracted by iron regardless of which nitrogen source was employed in the medium. On the normal nitrogen medium manganese was also effective in countering copper toxicity, but this was not the case on the sole nitrate medium. Decreased nitrite reductase activity was noted on the sole nitrite medium, with a concomitant excretion of nitrite into the medium. The nitrite reductase inhibition as well as the nitrite accumulation were eliminated by supplemental iron.

80-3185. Dikshith, T. S. S.; Datta, K. K.; Kushwah, H. S.; Chandra, P.; Raizada, R. B. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Effect of methyl demeton on vital organs & cholinesterase in male rats.** *Indian J. Exp. Biol.* 18(2): 163-166; 1980 (31 references).

Adult male rats were treated with topical applications of methyl demeton (5 mg/kg/day) for period of 7 or 15 days. This treatment for 15 days caused no sign of poisoning nor did any deaths result. All animals appeared normal. Necropsy revealed no changes in skin, liver, kidney, testis, epididymis, adrenal and brain. Microscopic examination of the liver revealed degeneration of the hepatocytes in some areas of the parenchyma and focal areas of necrosis irregularly distributed in the parenchyma after the 15 days. After 7 days only degenerative changes in the hepatocytes as cytoplasmolysis were noted. After 15 days of rest from the treatment, no necrotic areas in the parenchyma were noted except the focal area. The inhibition patterns of cholinesterase in the serum and brain of the methyl demeton intoxicated rat was highly significant. After 7 days the percent inhibition in serum and brain was 57.17 and 59.80, respectively.

80-3186. Verma, S. P.; Bahga, H. S. (G. B. Pant Univ. Agric. & Technol., Pantnagar, India) **Some pharmacological studies on paraquat (1,1′-dimethyl-4,4′-bipyridinium dichloride).** *Indian Vet. J.* 55(5): 385-389; 1978 (10 references).

Effects of paraquat on the cardiovascular system, respiration, smooth and skeletal muscles were investigated. Paraquat was injected into the cannulated femoral vein of 5 mongrel dogs anesthetized with pentobarbital sodium. Paraquat (4 mg/kg, iv) produced a conspicuous fall in blood pressure lasting 2-3 min. The effect of adrenaline on blood pressure was significantly depressed. The effect of acetylcholine or histamine was not significantly altered. Atropine or promethazine did not modify the effect of paraquat on blood pressure. A significant increase in the rate of respiration was noted, but the depth of respiration was not influenced by paraquat. Paraquat decreased heart rate and decreased the amplitudes of P wave and QRS complex, while increasing the duration of S-T interval, Q-T interval and the T wave and the amplitude of the T wave. A decrease was noted in the force of cardiac contractility which recovered to normal in about 2 min. Paraquat at 0.4 μg/ml increased the resting tone of the rabbit duodenum, which action was blocked by atropine. In doses ranging from 100 μg/ml to 1 mg/ml paraquat had no effect on the resting tone or on the acetylcholine-induced contraction of frog's rectus abdominis muscle.

80-3187. Anees, M. A. (Dep. Sci. & Environ. Stud., Indiana Univ., Bloomington, IN 47401) **Haematological abnormalities in a freshwater teleost, *Channa punctatus* (Bloch), exposed to sub-lethal and chronic levels of three organophosphorus insecticides.** *Int. J. Ecol. Environ.* 4: 53-60; 1978 (26 references).

Adult freshwater teleost fish, *Channa punctatus*, was exposed to diazinon at 0.37 ppm for 24 hr, at 0.28 ppm for 96 hr, and at 0.15 ppm for 14 days. Similar studies were made using dimethoate at 10.00 ppm for 24 hr, 8.00 ppm for 96 hr and 5.00 ppm for 14 days. Methyl parathion was also used at 1.15 ppm for 24 hr, 1.05 ppm for 96 hr and 0.90 ppm for 14 days. All pesticides produced decreases in erythrocyte counts and hemoglobin concentrations, and increases in the mean corpuscular hemoglobin and color index. Methyl parathion and dimethoate consistently lowered the cellular and nuclear diameter of erythrocytes. The three pesticides caused fluctuations in the clotting time of the blood.

80-3188. Mount, M. E.; Traffas, V.; Milleret, R. J.; Oehme, F. W.* (Comp. Toxicol Lab., Kansas State Univ., Manhattan, KS 66506) **An unusual occurrence of toxaphene poisoning in swine.** *J. Am. Vet. Med. Assoc.* 177(5): 445-447; 1980 (19 references).

Ten of 15 sows developed an acute nervous disorder that resembled the effects of water deprivation-

salt poisoning. However, a unique set of circumstances had permitted the environmental persistence of a toxaphene-lindane insecticide combination for approximately 1 month, with toxaphene toxicosis resulting. The diagnosis was based on the lack of lesions of salt poisoning and the finding of 4 ppm of toxaphene in the cerebellum and 0.3 ppm of toxaphene in the serum of 1 of the 2 sows that died. (Author abstract by permission)

80-3189. Van Duuren, B. L. (Lab. Org. Chem. & Carcinog., Inst. Environ. Med., Medical Center, New York Univ., New York, NY 10016) **Prediction of carcinogenicity based on structure, chemical reactivity and possible metabolic pathways.** *J. Environ. Pathol. Toxicol.* 3(3): 11-33; 1980 (50 references).

This review focuses on certain direct-acting and indirect-acting carcinogens and attempts to predict their carcinogenicity. Various ways in which chemical structure-carcinogenicity studies can be used to assess chemicals for carcinogenicity are discussed. Three cases in which human carcinogens (including the pesticide epichlorohydrin) were identified by these methods are described. Several animal carcinogens (including the pesticide dimethyl carbamyl chloride) discovered in this way are under study. Similar studies with cocarcinogens and tumor promoters are briefly noted. Such structure-activity studies can be used as guidelines towards the goal of pinpointing and eliminating human carcinogens, cocarcinogens and tumor promoters from the environment.

80-3190. Wattenberg, L. W. (Dep. Lab. Med. & Pathol., Univ. Minnesota, Minneapolis, MN 55455) **Inhibitors of chemical carcinogens.** *J. Environ. Pathol. Toxicol.* 3(3): 35-52; 1980 (54 references).

This paper reviews a diverse group of compounds which inhibit the action of chemical carcinogens when they are given simultaneously with or prior to exposure to carcinogens. The group is composed of both naturally occurring and synthetic chemicals. There are three modes of action. Disulfiram and related compounds directly block enzymatic activation of the carcinogen to its reactive ultimate carcinogenic form. BHA and related compounds stimulate coordinated detoxification response, which results in increased activity of detoxifying enzymes in the microsomes and also the cytosol. The third group of inhibitors induce increased aryl hydrocarbon hydroxylase (AHH) activity.

80-3191. Moody, D. E.; Head, B.; Smuckler, E. A. (Dep. Pathol., Sch. Med., Univ. California, San Francisco, CA 94143) **Reduction in hepatic microsomal cytochromes P-450 and b_5 in rats expose to 1,2-dibromo-3-chloropropane and carbon tetrachloride: enhancement of effect by pretreatment with phenobarbital.** *J. Environ. Pathol. Toxicol.* 3: 177-190; 1980 (35 references).

After acute intoxication of rats with DBCP, the microsomal cytochrome P450 content of the liver was decreased up to 80%. Acute intoxication with carbon tetrachloride resulted in 25% reductions in the hepatic content of this cytochrome. Microsomal protein and cytochrome b_5 levels were reduced by 25% in carbon tetrachloride-treated rats but were unchanged after DBCP treatment. Cytochrome P450 levels and *N*-demethylation of dimethylaniline showed a 40% reduction 48 hr after DBCP administration. After 48 hr, NADH ferricyanide (cytochrome b_5) reductase and cytochrome b_5 were only 60% of control values in DBCP-treated rats. Liver microsomal lipid extracts of carbon tetrachloride-treated rats displayed diene conjugation whereas those of DBCP-treated rats did not. NADPH cytochrome C reductase and cytochrome P450 levels were enhanced by pretreatment with phenobarbital. Enhanced mortality after 24 hr was found in DBCP-dosed rats pretreated with phenobarbital. When DBCP or carbon tetrachloride was added to nonreduced microsomes, type I binding spectra resulted. These data indicate that DBCP, like carbon tetrachloride, may be metabolized by the mixed-function oxidase system and that the reactive agent may be a product of this metabolism. In DBCP-treated rats the cytochromes showed a slower decline than in carbon tetrachloride-treated animals, suggesting an altered turnover of cytochromes rather than attack by lipid peroxides or destruction by the binding of a reactive metabolite.

80-3192. Demopoulos, H. B.; Pietronigro, D. D.; Flamm, E. S.; Seligman, M. L. (Dep. Pathol. Neurosurg., Med. Cent., New York Univ., New York, NY 10016) **The possible role of free radical reactions in carcinogenesis.** *J. Environ. Pathol. Toxicol.* 3(3): 273-303; 1980 (92 references).

This review deals with the role of free radical reactions in carcinogenesis. Pathologic free radical reactions may be directly involved with the carcinogen, the activation of the carcinogen, or the interaction of the carcinogen with DNA. Endoplasmic reticulum has the ability to activate carcinogens. This ability is dependent on normally occurring controlled free radical reactions. Among the substrates listed for these reactions with liver microsomal cytochrome P-450 are the insecticides dieldrin and parathion.

80-3193. Kayden, H. J. (Dep. Medicine, Med. Cent., New York Univ., New York, NY 10016) **Determinants in the control of lipid transport and metabolism.** *J. Environ. Pathol. Toxicol.* 3(3): 315-321; 1980 (8 references).

This review discusses the delivery of nutrients to tumors from the diet and from the synthesis of simple carbon fragments into energy sources. Dietary fat in the form of triglyceride, mostly dairy, vegetable and animal fat,

undergoes a process of emulsification in the body. The resulting lipid complex, a micelle, traverses the cell membrane of the intestinal cell, and is then resynthesized into the triglyceride. The bulk of transfer of dietary fat is from the intestines to the vascular circulation via the chylomicrons. Toxic compounds such as DDT and PCB enter the body in association with the lipids and are transferred across the intestinal wall with the chylomicrons. The ultimate fate of these contaminants is not known. Analyses are underway on the interrelation between the lipoprotein transport system and normal tissue. Similar studies are needed in the area of neoplastic tissues.

80-3194. Francis, B. M.; Hansen, L. G.; Metcalf, R. L. (Inst. Environ. Stud., Univ. Illinois, Urbana, IL) **Neurotoxicity of halogenated *O*-phenyl *O*-alkyl alkylphosphonothioates.** *J. Environ. Sci. Health B* 15(4): 313-331; 1980 (28 references).

Adult white leghorn hens were used in neurotoxicity testing of a series of 27 halogenated *O*-phenyl *O*-alkyl alkylphosphonothioates, which are being considered for use as pesticides. All compounds were administered in gelatin capsules. Acute doses were begun at 50 mg/kg and chronic doses at 10 mg/kg, and continued for 90 days. In subsequent hens, treatment levels were decreased until a non-lethal non-neurotoxic dose was established and/or increased until a neurotoxic (or lethal) dose was established. Hens were weighed and evaluated for gross ataxia, gross locomotor abnormality, and paralysis. The data indicated that 14 compounds were overtly neurotoxic, including 8 of 11 methylphosphonothioates, 3 of 7 ethylphosphonothioates, and 3 of 6 phosphoramidates, including the commercial herbicide DMPA. Results were related to structure, and it was found that neurotoxicity varied with the number of halogen substituents on the phenyl group, the identity of the 4-phenyl halogen, the alkyl group involved in the P-C or P-N bond, and with the identity of the *O*-alkyl group.

80-3195. Knowles, C. O.; Benezet, H. J.; Mayer, F. L. (Dep. Entomol., Univ. Missouri, Columbia, MO 65201) **Thidiazuron uptake, distribution and metabolism in bluegills and channel catfish.** *J. Environ. Sci. Health B* 15(4): 351-364; 1980 (3 references).

Experiments on the fate of the cotton defoliant thidiazuron in fish were performed by exposing bluegill sunfish and channel catfish to 0.1 ppm labeled herbicide for 1, 3, 7, 10, 14, 21 and 28 days. Some fish were then placed in herbicide-free water. Radioactivity was measured in fish tissues to determine distribution and concentrations. Metabolism was measured by injecting (ip) the radioactive thidiazuron into fish, and then analyzing tissue samples 6 and 24 hr after injection. The maximum level detected after thidiazuron exposure in water was 5.4 ppm after one day. After being placed in thidiazuron free water, the levels dropped to 1.0 ppm after 14 days. Most of the radioactive material in the intestinal tract was water soluble. Several breakdown products of thidiazuron were isolated, none of which appear to remain in the fish for long periods of time. It is suggested that thidiazuron will not pose a threat to the aquatic ecosystem.

80-3196. Crowder, L. A.; Lanzaro, G. C.; Whitson, R. S. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721) **Behavioral effects of methyl parathion and toxaphene exposure in rats.** *J. Environ. Sci. Health B* 15(4): 365-378; 1980 (14 references).

Studies were performed to determine if exposure to methyl parathion (MP) and toxaphene (T) had an effect on rat behavior. Female rats received daily oral doses of 1.0 mg/kg MP or 1.0 mg/kg MP + 2.0 mg/kg T between days 7 and 15 of pregnancy. A postnatal group of rats received 6 mg/kg T for 21 days and a perinatal group received 6 mg/kg T daily from day 7 of pregnancy to parturition. All pups were used to evaluate the grasp-hold, righting, startle and placing reflexes, as well as maze testing. Although mortality was higher in pups exposed to the pesticides, learning was not significantly impaired in exposed rats.

80-3197. Dewan, A.; Gupta, S. K.; Jani, J. P.; Kashyap, S. K. (Natl. Inst. Occup. Health, Ahmedabad 380016, Gujarat, India) **Effect of lindane on antibody response to typhoid vaccine in weanling rats.** *J. Environ. Sci. Health B* 15(4): 395-402; 1980 (9 references).

Studies were performed to test the immunosuppressive effects of lindane in rats. Typhoid-paratyphoid (TAB) vaccine was injected into control and lindane-fed rats. Agglutinin titers against *Salmonella typhi* O and H and *S. paratyphi* strains AH and BA were then determined. Controls consistently demonstrated higher antibody titers than those fed the pesticide. Within the experimental group, those fed 6.25 mg/kg lindane showed higher titers than those fed 25 mg/kg. It is suggested that suppression of antibody formation is an important aspect of the toxicity of this pesticide.

80-3198. Heick, H. M. C.; Shipman, R. T.; Norman, M. G.; James, W. (Dep. Biochem., Child. Hosp. East. Ontario, Ottawa, Ontario K1H 8L1, Canada) **Reye-like syndrome associated with use of insect repellent in a presumed heterozygote for ornithine carbamoyl transferase deficiency.** *J. Pediatr.* 97(3): 471-473; 1980 (12 references).

This is a case report of a 6-yr-old girl who extensively used an insect repellent containing *N,N*-diethyltoluamide (DET; Deet). The family history and tests performed on the child indicated that the girl was deficient in ornithine carbamoyl transferase (OCT). This deficiency was apparently agitated by the extensive use of

DET. Phthalyl alcohol was identified in the child's liver at least 10 days after administration. Under normal conditions DET is absorbed through the skin and excreted through the kidneys. Accumulation within the body has not been reported and its further metabolism has not been studied. Large oral doses produce ataxia, coma, and clonic convulsions in rats and rabbits. Three previously reported cases of DET encephalopathy are mentioned. It is suggested that these cases might also have suffered from OCT deficiency.

80-3199. Chu, I.; Villeneuve, D. C.; Becking, G. C.; Viau, A. (Environ. Health Dir., Health Prot. Branch, Ottawa, Canada) **Tissue distribution and elimination of 2,8-dihydromirex in the rat.** *J. Toxicol. Environ. Health* 6(4): 713-721; 1980 (12 references).

Studies were performed to determine the fate of [^{14}C]2,8-dihydromirex after iv injection into rats (10 mg/kg). Feces and urine were collected daily for 2 wk. After 2, 4 and 8 wk, the rats were exsanguinated and major organs were analyzed for radioactivity. Studies were also conducted on rats receiving oral doses (10 mg/kg) of 2,8-dihydromirex and iv injection of 10 mg/kg [^{14}C]photomirex. The distribution of these compounds was similar, with residues in all tissues examined. The highest concentrations occurred in fat, liver, and skin. No metabolites were detected in the feces and urine. The radioactivity in the tissues and feces was 90-100% dihydromirex.

80-3200. Rao, D. M. R.; Pyriyamvada Devi, A.; Murty, A. S. (Dep. Zool., Nagarjuna Univ., Nagarjunanagar, South India) **Relative toxicity of endosulfan, its isomers, and formulated products to the freshwater fish *Labeo rohita*.** *J. Toxicol. Environ. Health* 6(4): 825-834; 1980 (39 references).

Ninety-six hr LC50 values were determined for technical endosulfan, the isomers of endosulfan, and 2 formulated products (35% EC and 4% dust) using the freshwater fish *Labeo rohita* as a test organism. Juveniles were placed in continuous flow systems. Fish that survived the 96 hr exposure to 4 ppb endosulfan were analyzed for endouslfan and metabolites. LC50 values ranges from 0.33 ppb for endosulfan-A to 7.1 ppb for endosulfan-B. Metabolism studies showed that endosulfan is broken down many different ways leading to a variety of end products; the sulfate, alcohol, ether, α-hydroxy ether and the lactone of endosulfan. However, the principal detoxification route was by the formation of endosulfan ether in the liver. Histological studies showed that only the liver was damaged by endosulfan. Oxygen consumption studies demonstrated that both sublethal and lethal doses of endosulfan enhanced oxygen consumption.

80-3201. Ahrens, F. A.; Dyer, D. C.; Lloyd, W. E. (Dep. Vet. Physiol. & Pharmacol., Iowa State Univ., Ames, Lowa) **Mirex kinetics in chickens.** *J. Toxicol. Environ. Health* 6(4): 835-842; 1980 (15 references).

The movement of mirex through blood and other tissues of chickens was reported. Mirex (30 mg/kg) was injected iv into 7 chickens. Five other chickens were administered 300 mg/kg mirex via crop tubes. Blood and excreta were analyzed routinely for 2 wk, after which the chickens were killed and tissue analyses were performed. The greatest accumulation was in fat and skin. Less than 2% of the dose was excreted. A second experiment was performed in growing chickens to determine depletion rates in tissues. Calculated disappearance half-times were 24.8 days for skin and 31.5 days for fat. The dilution was attributed to the growth of the chickens.

80-3202. Hall, R. J.; Kolbe, E. (Patuxent Wildl. Res. Cent., U.S. Fish & Wildl. Serv., Laurel, MD) **Bioconcentration of organophosphorus pesticides to hazardous levels by amphibians.** *J. Toxicol. Environ. Health* 6(4): 853-860; 1980 (19 references).

Wild caught tadpoles *(Rana catesbeiana)* were exposed to a series of organophosphorus pesticides in a continuous flow dosing apparatus for 96 hr. Tadpoles were then fed to 2 wk old mallard ducklings, after which brain acetylcholinesterase activity was measured. Duckling and tadpole tissues were analyzed for pesticide levels. Parathion, fenthion and dicrotophos treated tadpoles caused adverse cholinesterase effects in the ducks. The parathion and the fenthion eventually caused complete mortality of the ducks. Residue levels in the tadpoles indicated significant bioconcentration; parathion was magnified an average of 64 times and fenthion 62 times. Many species of animals prey on amphibians, and the potential of bioaccumulation and the subsequent poisoning of the predators is discussed.

80-3203. Kukalenko, S. S.; Gar, K. A.; Volodkovich, S. D. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **Spetsificheskie akaritsidy (analiticheskii obzor). [Specific acaricides (literature review).]** *Khim. Sel'sk. Khoz.* 18(5): 29-33; 1980 (28 references) (Russian).

Literature pertaining to resistance of phytophagous mites to specific acaricides is reviewed. Use of organochlorine acaricides (kelthane) provided effective control against mites resistant to organophosphorus compounds. However, repeated use of kelthane (dicofol) against mites resistant to methylmercaptophos (methyl demeton) induced resistance to kelthane. These findings indicated the need for pesticides rotation; the alternating use of organochlorine compounds, nitrophenol derivatives, and various acaricides.

80-3204. Pilz, R.; Pfeifer, G.; Otto, D. (Inst. Plant Prot., Kleinmachnow, DDR) **O mekhanizme ustoichivosti pautinnykh kleshchei k fosfamidu. [Mechanism of spider mite resistance to phosphamide.]** *Khim. Sel'sk. Khoz.* 18(5): 33-34; 1980 (18 references) (Russian).

An attempt was made to evaluate the role of inhibition of oxidases and carboxylesterases in the mechanism of resistance to phosphamide dimethoate in spider mites. Addition of oxidase inhibitors to phosphamide increased the death rate of resistant mites from 7% to 11-37%. Inhibition of carboxylesterases caused insignificant increases in phosphamide toxicity. It was found that the level of resistance correlated with the degree of cholinesterase inhibition.

80-3205. Zheltov, V. A.; Shipitsina, Zh. A. (All-Union Res. Inst. Vet. Entomol. & Arachnol., USSR) **K toksikologii vinilfosfata dlia krupnogo rogatogo skota. [Toxicology of vinyl phosphate in cattle.]** *Khim. Sel'sk. Knoz.* 18(6): 50-52; 1980 (16 references) (Russian)

The toxicity of vinyl phosphate (VP; tetrachlorvinphos) after skin application and po administration was studied in cattle. Mild symptoms of intoxication (general inhibition, loss of appetite, and reduced response to the external irritants) were recorded after spraying of calves with VP at 600 mg/kg and after po administration at 80 mg/kg. Clinical symptoms of poisoning were associated with inhibition of 50% of the RBC acetylcholinesterase activity in cattle. The RBC cholinesterase inhibiting activities of different formulations of VP were also compared.

80-3206. Abelentsev, V. I. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **Resistentnost' vozbuditelei seroi i beloi gnili k proizvodnym benzimidazola. [Resistance of gray mould and watery soft rot pathogens to benzimidazole derivatives.]** *Khim. Sel'sk. Khoz.* 18(5): 36-39; 1980 (36 references) (Russian).

The rate of formation of resistance and cross-resistance to benzimidazol fungicides in *Botrytis cinerea* Pers. and *Coniothyrium diplodiella* (Speg.) Sass. (pathogens of gray and watery soft rot) was studied. Prolonged, 7 mo exposures to the fungicides Benacyl, BTnS, and Phenacyzol significantly increased (5-25 fold) resistance of the fungi. The acquired resistance was retained for 1 yr. Exposure to fungicides with different chemical structures resulted in a rapid reversion of this sensitivity.

80-3207. Roslavtseva, S. A. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **Ob ustoichivosti k pestisidam estestvennykh vragov chlenistonogikh (analiticheskii obzor). [Resistance to pesticides of natural enemies of Arthropoda (literature review).]** *Khim. Sel'sk. Khoz.* 18(5): 46-48; 1980 (31 references) (Russian).

Literature pertaining to resistance to pesticides among natural enemies of Arthropoda is reviewed. Resistant strains of predator mites were detected in the United States, New Zealand, and Uruguay. Selection of resistant races of the predator mite *Phytoseideae persimilis* markedly increased tolerance to organophosphorus insecticides. Resistant races can be introduced into greenhouses 1-2 days after treatment with Carbophos (malathion) and 4-5 days after treatment with Rogor (dimethoate). Replacing the methyl group in azinphos-methyl with ethoxy and *n*-propoxy groups decreased the resistance of predaceous mites. Replacement of sulfur by oxygen also led to a marked decrease in resistance. These findings were indicative of the role of glutathione-S-transferase in mechanism of resistance.

80-3208. Andreeva, E. I. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad USSR) **Trikhlorfenolyat medi. [Copper trichlorophenolate.]** *Khim. Sel'sk. Khoz.* 18(5): 55-56; 1980 (Russian).

Properties of the fungicide copper trichlorophenolate (CTCP) are reviewed. This fungicide is used for treatment of cotton seeds against bacterial blight. CTCP is toxic for warm-blooded animals: the LD50 for rats and mice is approximately 100 mg/kg. Maximum permissible concentrations are 0.1 mg/m^3 in the air of working zones and 0.1 mg/l in water.

80-3209. Martinez-Zedillo, G.; Castilho-Alonso, C.; Magdaleno, V. M.; Gonzalez-Angulo, A. (Subjefatura Invest. Cient., Cent. Med. Nac., Inst. Mexicano Seguro Soc., Mexico City, Mexico) **Cytochrome P-450 and parathion metabolism in the fetal and adult gonads of the horse.** *Life Sci.* 24(4): 327-331; 1979 (13 references).

Mixed function oxidase-catalyzed dearylation of parathion was determined in microsomal fractions of gonadal and liver tissues of fetal and adult horse. When parathion metabolism was calculated on a basis of milligram of protein, the activity was found to be similar between fetal and adult gonads but not liver. However, on a basis of nmoles of cytochrome P-450, parathion metabolism was similar between fetal and adult liver but not gonadal tissues; the metabolism being 20 times higher in the adult than the fetal gonad. (Author abstract by permission)

80-3210. Tofilon, P. J.; Peters, P. G.; Clement, R. P.; Hardwicke, D. M.; Piper, W. N. (Dep. Pharmacol., Med. Cent., Univ. Nebraska, Omaha, NE 68105) **Depressed guinea pig testicular microsomal cytochrome P-450 content**

by 2,3,7,8-tetrachlorodibenzo-p-dioxin. *Life Sci.* 27(10): 871-876; 1980 (26 references).

Human exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) can result in hirsutism and chloracne, symptoms that suggest an alteration in endocrine regulation. Consequently, the effect of TCDD on guinea pig testicular cytochrome P-450 has been investigated. Twelve hr after a single, oral dose of TCDD (1 μg/kg), testicular microsomal cytochrome P-450 content was depressed by approximately 36%. Microsomal cytochrome P-450 content reached a maximal depression at approximately 1 day (52% of control) and remained at this level for 9 days. No appreciable alteration of testicular microsomal heme levels or activity of testicular δ-aminolevulinic acid (ALA) synthetase were observed. (Author abstract by permission)

80-3211. Mane, U. H.; Kachole, M. S.; Pawar, S. S. (Dep. Zool., Marathwada Univ., Aurangabad 431002, India) **Effect of pesticides and narcotants on bivalve molluscs.** *Malacologia* 18(1-2): 347-360; 1979 (3 references).

The reactions of marine bivalves to DDT, endrin, thiometon, or malathion, were determined under laboratory conditions. In all pesticides, except malathion, the mortality of *Donax cuneatus* increased with increased exposure time. The least effects were noted for thiometon and malathion on *Katelysia opima* and *D. cuneatus*, respectively. The organs of the neurosecretory system, digestive tract and intestine were each affected differently by these pollutants. The pesticides in particular affected the hepatopancreas and intestine.

80-3212. Stewart, M. E.; Blogoslawski, W. J.; Hsu, R. Y.; Helz, G. R. (Sch. For. & Environ. Stud., Yale Univ., New Haven, CT 06520) **By-products of oxidative biocides: toxicity to oyster larvae.** *Mar. Pollut. Bull.* 10: 166-169; 1979 (18 references).

Possible threats to coastal and estuarine ecosystems from bromate, bromoform, and chloroform were investigated at concentrations of 0.05, 0.1, 1.0, and 10.0 mg/l. Significant toxicity to larvae was noted even at concentrations as low as 0.05 mg/l. Bromate had the greater effect, causing more than 90% mortality at concentrations of 1.0 mg/l. While this study does not prove that these chemicals present serious threats to estuarine and coastal ecosystems receiving them as wastes, this might be the case, particularly for bivalve larval inhabitants. Precursors of chloroform and bromoform form very rapidly and are not subsequently destroyed by the usual dechlorinating agents. Similarly, bromate is not likely to be destroyed rapidly either.

80-3213. Morito, T.; Wada, H.; Kinoshita, N.; Morita, N.; Yamaguchi, T.; Okuda, H.; Hayashi, H.; Nakano, M.; Shuzui, T. (Dep. Int. Med., Saiseikai Matsuzaka Hosp., Matsuzaka, Mie, Japan) **[An autopsy case of paraquat poisoning.]** *Mie Igaku (J. Med. Mie Prefect. Univ.)* 23(4): 518-521; 1980 (21 references) (Japanese).

A 29-yr-old man committed suicide by ingesting about 2000 ml of a paraquat formulation. He was hospitalized shortly thereafter with slightly clouded consciousness, redness and erosion of the oral cavity and pharynx, and low blood pressure. Biochemical data on hospital day 2 indicated severe damage to the liver and kidneys; BUN, 23.5; creatinine, 3.2; GPT, 29; and GOT, 78. Liver and kidney functions were worse on day 3. Blood gas analysis suggested an A-C block and metabolic acidosis. The chest X-ray was not abnormal. The patient died on day 3. Autopsy revealed denaturation of the kidney tubules, fatty degeneration with slight stagnation of liver hepatic cells, pulmonary edema, diffuse infiltration of neutrophils in the lung, hemorrhagic necrotic foci with exfoliation of the alveolar epithelium, swollen zona glomerulosa and atrophy and necrosis of the zona fasciculata.

80-3214. Leonard, A.; Lauwerys, R. R. (Mammal. Genet. Lab., Dep. Radiobiol., CEN-SCK, B-2400 Mol, Belgium) **Carcinogenicity, teratogenicity and mutagenicity of arsenic.** *Mutat. Res.* 75(1): 49-62; 1980 (149 references).

Arsenic may be released into the environment through industrial processes and through the generation of power from coal. It is also widely used in agriculture and was formerly used extensively in medicine. For the general population, exposure to arsenic occurs mainly through the ingestion of foodstuffs containing inorganic and organic arsenicals. Trivalent arsenicals are regarded as being primarily sulfhydryl reagents which inhibit a number of thiol-dependent enzymic systems in various tissues. Arsenite also has an effect on DNA synthesis and DNA repair. Owing to its lower affinity for hydroxy and thiol groups, pentavalent arsenate inhibits fewer enzymic systems. Although there is no reliable evidence that arsenic produces tumors in experimental animals, epidemiological studies show that the incidence of epidermoid carcinomas of the skin and lungs, and of pre-cancerous dermal keratoses, is significantly increased in human subjects who have been chronically exposed to arsenic compounds by oral or respiratory routes. Arsenic appears to be one of the only teratogenic members of the Group V metals. Most of the studies performed on the mutagenic activity of arsenic have provided positive results. They involve experiments on microorganisms, plant material and *Drosophila* as well as observations on the ability of this metal to induce, *in vitro* and *in vivo*, chromosomal aberrations in mammalian cells. (Author abstract by permission)

80-3215. Sussmuth, R.; Ackermann-Schmidt, B.; Lingens, F. (Inst. Mikrobiol., Univ. Hohenheim, D-7000

Stuttgart 70, BRD) **Activation of liver microsomes by 2,3,4,5-tetrachlorophenol.** *Mutat. Res.* 77(3): 279-282; 1980 (9 references).

A *Salmonella* test system was used to investigate the activation of rat liver microsomes by chlorinated phenols. Sprague-Dawley rats of 200 g body wt were injected ip with different amounts (0.43 and 1.3 mmol) of 2,3,4,5-tetrachlorophenol dissolved in ethanol. After injection the liver microsomes from rats showed a metabolic activation twice as high as liver microsomes from untreated controls. When the microsomes were isolated from rats treated with 1.3 mmol 2,3,4,5-tetrachlorophenol, the AHH activity was twice as high as in controls. Livers of treated rats showed a striking red color compared with untreated rats. This color was due to contamination with an oxyhemoglobin. These results indicate that an amount of 0.1 mg/200 g body weight applied ip is sufficient for significant activation of liver microsomes. The highly toxic phenol derivatives in very low concentrations can therefore function as induction agents.

80-3216. Vigfusson, N. V.; Vyse, E. R. (Dep. Biol., Eastern Washington Univ., Cheney, WA) **The effect of the pesticides, Dexon, captan, and Roundup, on sister-chromatid exchanges in human lymphocytes *in vitro*.** *Mutat. Res.* 79(1): 53-57; 1980 (24 references).

Three pesticides at varying concentration were tested for the induction of sister-chromatid exchanges (SCE) in human lymphocytes *in vitro*. The fungicide Dexon (fenaminosulf), sodium [4-(dimethylamino)phenyl]diazene sulfate, was found to cause the greatest increase in SCE frequency and the response was dose related. The herbicide Roundup (glyphosate), isopropylamine salt of *N*-(phosphonomethyl)glycine, had the least effect on SCE, requiring the use of much higher concentrations to produce an effect. Limited results were obtained with the fungicide captan, *cis-N*-[(trichloromethyl) thio]-4-cyclohexane- 1,2-dicarboximide, because of toxic levels of either the fungicide or solvent used. (Author abstract by permission)

80-3217. Evans, P. D.; Gee, J. D. (ARC Unit Invertebr. Chem. Physiol., Dep. Zool., Univ. Cambridge, Cambridge, CB2 3EJ, UK) **Action of formamidine pesticides on octopamine receptors.** *Nature (London)* 287(5777): 60-62; 1980 (14 references).

The formamidines are a structurally novel group of pesticides of growing importance in the control of mites, cattle ticks and certain orders of insects which have become resistant to conventional acaricides and insecticides. Their mode of action is complex with dose-dependent lethal and sublethal effects. At sublethal levels they cause behavioral changes in the target pest species (for example in feeding and in mating behaviors), changes which are responsible for the protective effects on crops and livestock. Although many suggestions have been made for the underlying biochemical mechanism, including inhibition of monoamine oxidase activity, uncoupling of respiration and blockade of neuromuscular transmission, no direct evidence has been presented. Another possibility is interaction with octopamine receptors in the central nervous system. We report here that the formamidine acaricide/insecticide, chlordimeform (CDM), and its demethylated derivative can mimic the actions of octopamine at the locust neuromuscular junction. This gives the clearest evidence to date of the site of action of the formamidines and indicates a novel mode of action for these pesticides. (Author abstract by permission)

80-3218. Fukuda, H.; Shibamoto, S.; Takenaka, H.; Kashiwara, T.; Kawakami, F.; Takao, H.; Urano, T.; Okuno, K.; Toda, Y.; Kurata, Y. (Dep. Int. Med., Itami Munic. Hosp., Itami, Hyogo, Japan) **[An intoxication case due to paraquat dichloride.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Int. Med.)* 69(7): 875-876; 1980 (Japanese).

A 44-yr-old woman committed suicide by ingesting 50 ml of paraquat diluted with water. Nausea and vomiting commenced 1 hr after ingestion. The patient was hospitalized the next day with extreme white coating of the oral cavity and redness in the pharynx. The GOT was 412, the GPT was 356, the BUN was 45, occult blood was present in the feces, and liver and kidney disturbances were noted. Despite treatment, dyspnea was present from day 5 on, and on day 11, the $P(O_2)$ was 33.2 mmHg and the $P(CO_2)$ was 30.2 mmHg. The patient died on hospital day 26. Histopathological findings upon autopsy included intense interstitial fibrosis on the lungs, conspicuous denaturation of the proximal tubules and extreme dilation of the distal tubules in the kidneys, fatty degeneration of cells around the portal vein and sporadic cellular necrosis in the central region of the liver lobes.

80-3219. Sugaya, H.; Ohe, T.; Ueno, T.; Kawashima, T.; Sugita, T.; Maehara, M.; Hisauchi, T.; Iori, M.; Harada, H.; Shigemata, S. (Dep. Int. Med. II., Dokkyo Med. Coll., Saitama, Japan) **[Clinical discussion on six cases of paraquat dichloride intoxication.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Int. Med.)* 69(7): 876; 1980 (Japanese).

Six cases of paraquat intoxication admitted to a hospital over a 12 mo period are compared. Five patients intentionally ingested paraquat, and 5 of the 6 cases were fatal. Two of the 6 were men, 4 were women, and the ages ranged from 37 to 69 years. Three cases were autopsied. Upon hospitalization 4 had detectable paraquat in the urine. Pre-shock and dyspnea were the only other remarkable admission symptoms. Within 24 hr, remarkable pathology of the oral cavity and pharynx were noted. Serum amylase levels greatly exceeded normal levels in all 5 fatal cases. Metabolic acidosis was the major cause of death in 3 cases, and respiratory failure due to in-

terstitial pneumonia was the major cause of death in the other two. In the survivor, slight liver and kidney damage, but no lung damage, was observed. Paraquat was not detected in this patient's urine upon admission.

80-3220. Sato, T.; Mori, K.; Haseda, Y.; Yamamoto, H.; One, T.; Miwa, U.; Kawamura, Y.; Ohya, T.; Kinoshita, Y. (Dep. Int. Med., Ishikawa Prefect. Cent. Hosp., Kanazawa, Ishikawa, Japan) **[A case of autopsy of acute renal failure and hepatic failure due to intoxication by paraquat dichloride.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Int. Med.)* 69(7): 876; 1980 (Japanese).

The autopsy of a 25-yr-old man who accidentally ingested about 50 ml of a paraquat formulation is reported. By hospital day 2 erosion of the oral cavity was evident. Jaundice and anuria were noted on day 4. From day 6, dyspnea, reduced $P(O_2)$ and chest X-ray abnormalities were observed. Increased interstitial shadows and spot-like shadows appeared on the X-rays. The patient died on hospital day 11 of respiratory and cardiac failure. Multiple hemorrhaging and thickening of the alveolar walls of the lung, cellular necrosis of the liver veins, and necrotic kidney tubule cells were noted upon autopsy. Paraquat concentrations in the kidneys, pancreas, liver and lung were extraordinarily high upon autopsy, even though no paraquat had been detected in blood after the first blood dialysis.

80-3221. Takahashi, M.; Kasahara, H.; Inokuchi, K.; Wakai, S.; Sasaki, K.; Sone, K.; Iwami, T.; Kimura, M. (Sch. Pharmacol., Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan) **[Experimental studies on the concentration of organophosphorus pesticides in the living body. Part II. Effects of fenitrothion administration on rabbits with carbon tetrachloride induced hepatic disturbance.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(2): 99-107; 1980 (19 references) (Japanese).

Rabbits were given carbon tetrachloride to induce slight or moderate hepatotoxicity. Fenitrothion was orally administered to these rabbits at 5 or 20 mg/kg/day for 3 consecutive days. The concentration of fenitrothion, in blood, and its metabolite (*p*-nitro-*m*-cresol), in urine, were measured with time. Liver function and histopathology were also investigated. In animals without induced hepatotoxicity, fenitrothion disappearance from blood was remarkably rapid; after 72 hr fenitrothion could not be detected. The excretion of *p*-nitro-*m*-cresol was also very rapid in these animals; urine concentrations were large within 24 hr after administration, but returned to normal values after 1 wk. No difference was observed on the fate of fenitrothion and *p*-nitro-*m*-cresol among normal rabbits and those with slight or moderate hepatotoxicity. Serum and erythrocyte cholinesterase activities were inhibited to a greater extent in rabbits with hepatotoxicity than in normal rabbits. The recovery of ChE activities was also delayed. No abnormal findings attributable to the administration of fenitrothion could be obtained upon histopathological examination of liver and kidneys or upon examination of hepatic functions.

80-3222. Nakayama, J.; Akagawa, E.; Akitomi, K.; Miyamura, K. (Dep. Int. Med., Nagato Gen. Hosp., Nagato, Yamaguchi, Japan) **[Two cases presumably attributable to acute intoxication by agricultural pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(2): 123; 1980 (Japanese).

Two cases of intoxication from mixed pesticides are reported. A 42-yr-old woman was admitted to the hospital with paroxysmal spasms, fatigue and clouded consciousness. Chills, cyanosis, hypotension, tachycardia and reduced plasma cholinesterase activity were noted after hospitalization. In the second case, a 46-yr-old woman with nausea and fatigue was admitted to the hospital. Chills, loss of appetite, atony and remarkably reduced cholinesterase activity were noted. In both cases, the women were applying large amounts of unknown pesticides when the initial symptoms occurred. In case one, 3 pesticides were mixed and in case two, 2 pesticides were combined. Both patients recovered after treatment with PAM and atropine.

80-3223. Suzuki, T.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Hill reaction inhibitors formed on oxidative metabolism of phenylurea herbicides.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 267-270; 1980 (7 references).

A chloroplast/2,6- dichlorophenolindophenol system for visualizing Hill reaction inhibitors on thin layer chromatography plates was used to analyze metabolites of diuron, methazole and linuron formed by mouse microsomal oxidases. Most of the observed metabolite reactions involved *N*-demethylation of each phenylurea and *O*-demethoxylation of linuron. The isourea-*N*-oxide formed was a new compound, a potent Hill reaction inhibitor, and a metabolite of diuron and methazole. It is noted that microsomal enzyme studies monitoring Hill reaction inhibitors provide a rapid, specific and sensitive method for detecting active metabolites and evaluating activation and detoxification steps in metabolism of several types of herbicides.

80-3224. Nomeir, A. A.; Dauterman, W. C. (Toxicol. Program, Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Studies on the optical isomers of EPN and EPNO.** *Pestic. Biochem. Physiol.* 10(2): 121-127; 1979 (21 references).

Optical isomers of EPN and EPNO were prepared.

At pH 8.0 or 9.0 there was no significant difference in the rate of alkaline hydrolysis of the isomers. House flies were more susceptible to the (+)-isomers. The (+)- and (-)-isomers as well as the racemic mixture of EPN were practically equally toxic to mice. The (+)-EPNO was more toxic to mice than was the corresponding (-)-isomer. The (+)-EPNO isomer has a higher bimolecular rate constant than the corresponding (-)-isomer. The difference in toxicity of the (+)- and (-)-isomers appears to be due to a difference in the reaction rate with the target enzyme.

80-3225. Duncan, J. (Cent. Overseas Pest Res., London W8 5JS, England) **The toxicology of molluscicides. The organotins.** *Pharmacol. Ther. Part A* 10(2): 407-429; 1980 (158 references).

The toxicology of organotins used as molluscicides is reviewed, with emphasis on their proposed use for the control of vectors or intermediate hosts of certain tropical diseases. The wide range of uses for organotin compounds is discussed, with laboratory and field studies on their molluscicidal properties being detailed. Current knowledge on acute and chronic mammalian toxicity is presented, since this information is critical in evaluating its use in certain disease control. For this reason, absorption, distribution, and excretion of organotins is described, along with their action at the cellular level. Environmental effects, including effects on other aquatic biota and environmental transformation, are described. Based on this information, the possible use of organotin molluscicides in the control of the disease schistosomiasis is considered.

80-3226. Fukami, J. I. (Lab. Insect Toxicol., Inst. Phys. Chem. Res., Wako, Saitama, Japan) **Metabolism of several insecticides by glutathion *S*-transferase.** *Pharmacol. Ther. Part A* 10(3): 473-514; 1980 (110 references).

Conjugation with reduced glutathione (GSH) is the first step in mercapturic acid formation, one of the metabolic pathways for detoxification of xenobiotics *in vivo*. Enzymatic properties and kinetics involved in this reaction are reviewed. Glutathione *S*-transferase is really a group of enzymes, including glutathione *S*-alkyltransferase, glutathione *S*-aryltransferase, glutathione *S*-aralkyltransferase, glutathione *S*-epoxide-transferase, and glutathione *S*-alkenetransferase. GSH reactions with insecticides include GSH-dependent dealkylation, and dearylation of organophosphorus compounds. The significance of these reactions and the distribution and purification of the glutathione *S*-transferases from different species are discussed. Organochlorines such as DDT and BHC are also metabolized with the aid of glutathione *S*-transferase in a wide variety of tissues. Some consideration is also given to carbamate and organothiocyanate insecticides. The enzymatic reactions resemble nucleophilic substitution reactions. This resemblance may make it possible to estimate suitable substrate properties for the enzyme action.

80-3227. Olinski, R.; Walter, Z.; Wiaderkiewicz, R.; Lukasova, E.; Palecek, E. (Dep. Biochem., Univ. Lodz, Lodz, Poland) **Changes in DNA properties due to treatment with the pesticides malathion and DDVP.** *Radiat. Environ. Biophys.* 18(1): 65-72; 1980 (32 references).

In vitro studies using calf thymus DNA were carried out to determine some effects of malathion and DDVP (dichlorvos). The incubation mixture contained 1 ml of DNA (860 μg) in SSC (0.15 *M* NaCl + 0.015 *M* sodium citrate pH 7) and 10 *l* of malathion or DDVP dissolved in 96% ethanol. The final concentration of pesticide was 45 m*M*, and the mixture was incubated for 0.5, 1, 6, 12, 24 or 72 hr at 37°C. The properties of the DNA were investigated using derivative (differential) pulse polarography (DPP), thermal denaturation curves recorded spectrophotometrically (Tm), viscometric measurements, and chromatography on the hydroxyapatite column. In most experiments only DPP showed significant changes. The DPP data indicate the formation of single-stranded segments and thermolabile regions in DNA due to the action of the pesticides. The 2 pesticides differ in their reaction: DDVP induced the formation of small amounts of single-stranded DNA after 6 hr incubation, whereas approximately the same amount of DNA is formed only after 36 hr of incubation with malathion. It is suggested that this reaction may be due to guanine alkylation followed by depurination and chain scission at elevated temperatures.

80-3228. Giurgea, R. (Biol. Res. Cent., Cluj, Romania) **Reaction of the thymus of Wistar rats treated with alar and disulfoton.** *Rev. Roum. Biol.* 24(1): 59-61; 1979 (11 references).

Thirty-day-old, adult, female, Wistar rats were dosed with Alar (daminozide) or disulfoton in milk for 3 or 6 mo. Alar was administered at 200 or 1000 mg/kg body wt/day and disulfoton at 22 or 100 μg/kg body wt/day. Thymus weights and concentrations of RNA, DNA, total protein and glycogen in the thymus were observed in treated and control animals. After 3 mo, Alar at both dose levels significantly lowered thymus RNA content. Significant differences between controls and Alar-treated rats were observed in thymus wt, total protein and glycogen at 3 mo and in RNA, DNA and glycogen at 6 mo. Only glycogen levels were significantly altered by 22 μg disulfoton at 3 mo. However, at 110 μg/kg, disulfoton caused significant changes in all parameters after 3 mo except thymus wt. No significant differences were observed for 22 μg disulfoton treatments after 6 mo. RNA, DNA and glycogen levels were again significantly different after 6 mo treatment with 110 μg/kg disulfoton. It is postulated that the toxic action of these pesticides could be RNA polymerase inhibition. Further investigation into this theory is suggested.

80-3229. Krzeminska, A. (Dep. Hyg. Toxicol., Natl. Inst. Public Health, PL-00-791 Warsaw, Poland) **Wplyw**

zwiazkow trojfenylocynowych na rozwoj jajnikow u muchy domowej *(Musca domestica* L.). [Effect of triphenylstannous compounds on the development of ovaries in the fly *(Musca domestica* L.).] *Rocz. Panstw. Zakl. Hig.* 31(1): 79-86; 1980 (14 references) (Polish).

Fentin acetate (0.1%), fentin hydroxide (0.1%), decafentin (1%), and metepa (0.5%) were given in the diet to 0-4-hr-old female houseflies, and the effects of these pesticides on the ovarian development were determined according to Christophers and Mer. The triphenyltin compounds were found to inhibit the process of vitellogenesis. At the age of 5 and 10 days, the ovaries were only in phase II of development in the treated females. Scanty granules of vitelline substance were visible around the oocyte, while mature eggs were present in the ovaries of the control females. Metepa had a weaker effect, and some females completed the first phase of oogenesis successfully, even though with delay.

80-3230. Syrowatka, T.; Tyrkiel, E.; Wiadrowska, B.; Nazarewicz, T. (Dep. Toxicol., Inst. Public Health & Hyg., Warsaw, Poland) **Badanie wplywu rownoczesnego podawania azotynu sodowego na dzialanie toksyczne i koncerogenne karbendazymu w doswiadczeniu przewleklym. [Investigations on the effects of simultaneous administration of sodium nitrite on the toxic and carcinogenic activity of carbendazim in a long-term experiment.]** *Rocz. Panstw. Zakl. Hig.* 31(2): 117-123; 1980 (Polish).

The effects of individual and simultaneous administration of carbendazim and sodium nitrite to Wistar rats were investigated. Sodium nitrite at 100 mg/l water and carbendazim at 1000 mg/kg diet, as well as their combination, did not alter weight gain or feed and water intake of the rats. Histological examination of brain, intestines, lung, kidney, adrenal glands and gonads did not reveal significant pathological alterations, nor were the ratios of these organ weights to the body weight altered in any treatment group. By the end of 15 mo of observation, 8 of 30 rats in the control group had died, compared to 9 of 30 in the group given sodium nitrite, 19 of 30 in the group given carbendazim, and 11 of 15 in the group given a combination of the two substances.

80-3231. Podolak, M.; Warchocki, B. (Dep. Fundamental Res., Inst. Med. Prac. & Hyg., Lublin, Poland) **Wplyw toksobidinu na kinetyke reakcji inhibiciji cholinoesteraz chlorfenwinfosem i karbarylem. [Effects of Toxobidin on the reaction kinetics of cholinesterase inhibition by chlorfenvinphos and carbaryl.]** *Rocz. Panstw. Zakl. Hig.* 31(2): 125-131; 1980 (15 references) (Polish).

Effects of Toxobidin (obidoxime) were investigated on the inhibition by chlorfenvinphos and carbaryl of cholinesterases obtained from human blood and from purified equine serum. The kinetic constants of enzyme-inhibitor reactions, with and without addition of the oxime, were determined by the potentiometric method of Mains and Iverson. A special reaction vessel made it possible to reduce the reaction time to about 1 sec. The affinity constant (K_s) found for chlorfenvinphos was 0.9 μmol/l; thus its affinity for cholinesterase was high. Toxobidin reduced this affinity to a K_s value of 2.6 μmol/l. The phosphorylation constant k_2 of 8.35/min was slightly decreased (to 8.05/min) in the presence of Toxobidin. In the case of carbaryl no effect of Toxobidin on the K_s value was observed: in the case of the carbaryl-cholinesterase system this value was 14 μmol/l, and for the system with enzyme, 11 μmol/l. The k_s carbamylation constant for carbaryl was 1.02 11/min, and it increased to 3.20/min in the presence of Toxobidin. Thus Toxobidin caused a rise in the inhibitory potential as demonstrated by the values I_{50}, k_2, k_s, and reduced the inhibitory potential of chlorfenvinphos.

80-3232. Sabbioni, E.; Goetz, L.; Marafante, E.; Gregotti, C.; Manzo, L. (Chem. Div., Commiss. Eur. Comm., I-21020 Ispra, Italy) **Metabolic fate of different inorganic and organic species of thallium in the rat.** *Sci. Total Environ.* 15(2): 123-135; 1980 (39 references).

Two groups of 8 albino Sprague-Dawley rats were injected ip with 2 μg of Tl^{+}/rat as sulfate or with the same amount of Tl^{3+}, plus 1.85 Mbq (50 μCi) of ^{201}Tl in the same chemical form. Four rats from each group were sacrificed at 2 and 40 hr post-injection. In additional experiments rats were treated orally by intragastric tube with 3.15 mg of Tl/rat as inorganic mono-(I), trivalent Tl-(III) or dimethylthallium as bromide plus 1.85 Mbq (50 μCi) of ^{201}Tl in the same chemical form. The results of the study indicate that the oxidation state of thallium does not influence its metabolism *in vivo*. The similar biochemical behavior of the different thallium species is probably related to a mechanism which transforms the different species to a single form.

80-3233. Hajjar, N. P.; Hodgson, E. (Toxicol. Prog., Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Flavin adenine dinucleotide-dependent monooxygenase: its role in the sulfoxidation of pesticides in mammals.** *Science* 209(4461): 1134-1136; 1980 (15 references).

The flavin adenine dinucleotide-dependent monooxygenase in mammalian hepatic microsomes plays a major role in the oxidative metabolism of thioether-containing pesticides. Thirty-four compounds were tested, and it was determined that organophosphorus insecticides such as disulfoton and phorate are rapidly oxidized by the purified enzyme to their corresponding sulfoxides. The enzyme does not catalyze the oxidation of the thiophosphoryl and thiol sulfur atoms of these or other phosphorothioates and phosphorodithioates, or the oxidation of the sulfoxide

to the sulfone. Carbamates aldicarb and Croneton are also oxidized, but at a lower rate. (Author abstract by permission. Copyright 1980 by the American Association for the Advancement of Science)

80-3234. Ray, R. C.; Sethunathan, N. (Cent. Rice Res. Inst., Cuttack-753006, India) **Effect of commercial formulations of hexachlorocyclohexane and benomyl on the oxidation of elemental sulfur in soil.** *Soil Biol. Biochem.* 12(4): 451-453; 1980 (13 references).

An alluvial soil and a lateritic soil were treated with 5% HCH (BHC) granules and 50% wettable powder benomyl to provide concentrations of 5, 10, 50 and 100 μg/g active ingredient. Alluvial soil was more active in oxidizing elemental S than the lateritic soil. In the absence of pesticides most of the added S was oxidized in alluvial soil within 50 days as compared to only 50% oxidation in lateritic soil. HCH caused great inhibition of S-oxidation at 5 μg/g in the lateritic soil; benomyl caused a slighter inhibition. In lateritic soils without pesticides, the pH decreased from 5.9 to 4.2 in a 50 day period. The presence of pesticides, and subsequent inhibition of S-oxidation, prevented this drop in pH. The granular formulation of HCH was the most effective form of HCH in inhibiting S-oxidation, followed by the wettable powder and emulsifiable concentrate, while technical HCH was not inhibitory.

80-3235. Swenberg, J. A.; Petzold, G. L. (Chem. Ind. Inst. Toxicol., Res. Triangle Park, NC) **The usefulness of DNA damage and repair assays for predicting carcinogenic potential of chemicals.** In: *Strategies for Short Term Testing for Mutagens/Carcinogens.* Butterworth, B. E., ed. (CRC Press: West Palm Beach): pp. 77-86; 1979 (38 references).

A review is presented which critically assesses the use of DNA damage and repair assays for predicting the carcinogenic potential of chemicals. These assays, which include *in vitro* DNA damage, *in vitro* repair, and *in vivo* DNA damage, are short term tests which have been shown to correlate with carcinogenic and mutagenic potential. Schematics of the carcinogenic process and of pathways for DNA damage and repair are presented to show how these assays relate to the carcinogenic process. The status of validation studies using *in vitro* and *in vivo* systems is discussed. Results of *in vitro* DNA damage and repair assays are summarized in tabular form. Two or more investigators evaluated 52 chemicals, and complete agreement existed for 44 (85%). The poorest agreement between investigators exists in results on the alkyl halides (dieldrin, chlordane and cyclophosphamide). It is noted that much less attention has been given to *in vivo* DNA damage and repair assays, but that these mammalian assays appear to be good predictors of carcinogenic potential, and the overall correlation of test results is quite good.

80-3236. Schwetz, B. A. (Toxicol. Res. Lab., Dow Chemical USA, Midland, MI) **Discussion of hypothetical test case A.** In: *Strategies for Short Term Testing for Mutagens/Carcinogens.* Butterworth, B. E., ed. (CRC Press: West Palm Beach): pp. 105-116; 1979.

A hypothetical case concerning the mutagenicity and carcinogenicity testing of a chemical is presented, along with an ensuing panel discussion on the steps required to adequately test the substance and protect the public. The hypothetical chemical is seen as one having a high volume of usage, a high degree of human exposure, and no medical evidence of any problems. A 2 yr rat study gave negative results, but several short-term mutagenesis studies showed positive results. The discussion centered around various alternatives, ranging from doing no additional work to carrying out an extensive investigation in animals. If addition work would be decided upon, the possibilities for studies are described, and the merits discussed in detail. Among the topics considered are when to inform the exposed population and what information to give, whether to conduct expensive, lengthy animal-studies or wait for more results on short-terms studies, and whether to curtail use of the product based on this conflicting evidence. Some of the participants felt that a long-term study on a second species should be conducted concurrently with additional short-term mutagenicity testing. In the meantime, unnecessary exposures to the chemical should be curtailed or minimized. It is suggested that although this is a hypothetical case, the information could be applied to any one of a number of chemicals currently in use and being evaluated.

80-3237. Teramoto, S.; Saito, R.; Shirasu, Y. (Toxicol. Div., Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **Teratogenic effects of combined administration of ethylenethiourea and nitrite in mice.** *Teratology* 21(1): 71-78; 1980 (24 references).

Teratogenic potential of ethylenethiourea (ETU) was investigated in SLC-ICR mice after its reaction with sodium nitrite. ETU was given orally in dose of 400 mg/kg on various days of pregnancy in combination with 200 mg/kg $NaNO_2$ at varied intervals. When $NaNO_2$ was given to females immediately after their treatment with ETU on day 6 or 8 of pregnancy, fetal survival was significantly decreased. Various types of malformations were observed in the living fetuses from mothers treated on day 6, 8 or 10 of pregnancy, but not on day 12. The teratogenicity disappeared when $NaNO_3$ was given 2 hr after the treatment with ETU. (Author abstract by permission)

80-3238. Kelman, B. J.; Steinmetz, S. E.; Walter, B. K.; Sasser, L. B. (Comp. Anim. Res. Lab., Batelle, Richland, WA 99352) **Absorption of methylmercury by the fetal guinea pig during mid to late gestation.** *Teratology* 21(2): 161-165; 1980 (19 references).

Pregnant guinea pigs were injected with ~1 μg/kg of $CH_3^{203}HgCl$ at 22, 40, 47, 59 and 66 days of gestation, and fetal tissues were obtained 24 hr later. Autologous fetal erythrocytes were labeled with ^{51}Cr and used to label the fetal blood pool at each gestational age except 22 days so that tissue-bound Hg could be calculated. In general, Hg absorbed by the whole fetus increased during gestation, in parallel with increasing tissue mass, while Hg found in whole placentas remained the same. Hg concentrations in whole fetus and placenta were closely correlated, as were Hg concentrations in brain, liver and kidney. Liver, kidney, blood and brain contained the highest Hg concentration early in gestation. While it is difficult to interpret potential effects of the increased Hg concentrations, particular attention should be paid to the brain, since it is considered a target tissue in MeHg toxicity. (Author abstract by permission)

80-3239. Baxley, M. N.; Vedel, G. C.; Harrison, W. P. (Dep. Biol., Univ. Alabama, Tuscaloosa, AL) **Effects of oral sodium arsenite on mouse development.** *Teratology* 21(2): 27A; 1980 (1 reference).

Pregnant CD-1 mice (12-18/group) were gavaged with 40 mg/kg sodium arsenite on one of gestation days 8-15 and subjected to teratological examination of day 18 (plug day = day 1). Controls were solvent treated (H_2O) or untreated. With the exception of days 8 and 9, treatment resulted in increased prenatal mortality, particularly following day 10 treatment (34.6% *vs.* 3.6% for the solvent control). No other significant effects were observed, but some malformed fetuses were seen in litters exposed to arsenite on days 9 (3 of 223) or 10 (6 of 123). These results suggest that oral exposure of a pregnant mammal to inorganic arsenite is less dangerous to her developing offspring than would be expected from previous work employing ip injection. The critical periods for production of gross malformations are similar, however (days 9 and 10). Oral treatment of pregnant mice with a higher dose of arsenite (45 mg/kg) resulted in death of 29 of 80 gavaged females. Results of teratological examination of the offspring of females surviving at this dose level will also be reported. (Author abstract by permission)

80-3240. Massaro, E. J.; Olson, F. C. (Cent. Air Environ. Stud., Pennsylvania State Univ., University Park, PA) **Development of the adenyl cyclase system in normal and methylmercury-induced cleft palates of the mouse.** *Teratology* 21(2): 55A; 1980.

Exposure to methylmercury (MeHg: 10 mg Hg/kg maternal wt) on 12^6 (days^{6r} of gestation) significantly delays palate closure in the Swiss mouse, resulting in cleft palates in all fetuses examined at 17^6. The cAMP content, and activity of adenyl cyclase (AC) and phosphodiesterase (PDE) were measured in the tissues of control and MeHg induced cleft palates between 13^6 and 17^6. Lung and liver were similarly investigated to determine if MeHg affected the AC system of the palate in a unique manner. In control palatal tissue, cAMP levels increased from 13^{22} (undetectable) to 14^6 (maximum). PDE activity increased up to 14^2, but decreased (50%) between 14^2 and 14^6. Since cAMP may induce the synthesis of PDE, the difference in cAMP/PDE from 13^{22} to 14^2 and from 14^2 to 14^6 suggests localization of relatively high levels of cAMP in at least 2 separate compartments. Between 14^6 and 14^{10}, the AC activity of control palates decreased significantly suggesting relatively high AC activity in medial edge epithelial cells which undergo autolysis prior to shelf fusion (centered at 14^{15}). MeHg administration at 12^6 delayed the median time of palatal shelf rotation (14^{13}) by 5 hr, and significantly altered the developmental pattern of the AC system. Thus, the increase in cAMP between 14^2 and 14^6 was abolished and the decrease in AC activity between 14^6 and $14^{10}$was delayed by almost 20 hr. These changes may be manifestations of a MeHg induced delay in medial edge epithelial cell differentiation. Compared to palate and lung, MeHg only slightly altered the developmental pattern of the liver AC system. (Author abstract by permission)

80-3241. Ward, J. M.; Griesemer, R. A.; Weisburger, E. K. (Carcino. Test. Prog., Natl. Cancer Inst., NIH, Bethesda, MD 20205) **The mouse liver tumor as an endpoint in carcinogenesis tests.** *Toxicol. Appl. Pharmacol.* 51(3): 389-397; 1979 (50 references).

Available carcinogenesis and mutagenesis information was reviewed for 85 chemicals that were demonstrated to increase significantly the incidence of liver tumors in mice. Sixty-one chemicals (73%) induced tumors in other tissues of mice and/or rats. For 45 of the 61 chemicals for which bacterial mutagenesis information was available, 65% were mutagenic. Of 24 chemicals inducing only mouse liver tumors, 5 of 14 tested (35%) were mutagenic. Of all 59 chemicals causing liver tumors in mice for which mutagenesis information is available, 58% were mutagenic for bacteria, primarily *Salmonella typhimurium.* Several classes of chemicals were represented among those inducing only mouse liver tumors or mouse liver tumors and other tumors. The findings provide evidence that the mouse liver tumor is an important endpoint in carcinogenesis tests. Limited information on the subject also suggests that certain classes of chemicals may not be mutagenic and induce only mouse liver tumors. More importantly, several nonmutagenic mouse hepatocarcinogens also induce other tumors in mice or rats. The interpretation and significance of these findings awaits further research into the mechanisms of carcinogenesis. (Author abstract by permission)

80-3242. Elo, H. A.; Ylitalo, P. (Dep. Biomed. Sci., Univ. Tampere, SF-33101 Tampere 10, Finland) **Distribution of 2-methyl-4-chlorophenoxyacetic acid and**

2,4-dichlorophenoxyacetic acid in male rats: evidence for the involvement of the central nervous system in their toxicity. *Toxicol. Appl. Pharmacol.* 51(3): 439-446; 1979 (23 references).

The effects of different 2-methyl-4-chlorophenoxyacetic acid (MCPA) or 2,4-dichlorophenoxyacetic acid (2,4-D) pretreatments on the distribution of labeled [^{14}C]MCPA or [^{14}C]2,4-D given iv were studied in male rats. Single subcutaneous MCPA or 2,4-D pretreatment increased ^{14}C activity in the brain, cerebrospinal fluid (CSF), liver, muscle, heart, or testis, and decreased that in the plasma or kidney, while in the lung ^{14}C activity remained approximately unchanged. Changes in the distribution of ^{14}C activity as well as toxic signs such as myotonia and lethargy appeared within 0.5-1.5 hr after subcutaneous MCPA administration and disappeared in a few days. ^{14}C activities in the brain and CSF of both saline-treated adult and 10- or 21-day-old animals were very low as compared to the other tissues, but in the treated animals these and also absolute MCPA concentration increased to about the level in the muscle or testis. Chronic MCPA exposure had only a slight effect on the distribution of ^{14}C activity. The decreased binding of ^{14}C MCPA to plasma proteins caused by MCPA pretreatments may explain the increase of ^{14}C activity in many tissues but not the high increase in the brain and CSF during intoxication. The results indicate that at large doses either the influx of MCPA and 2,4-D into the brain is highly increased or their efflux out of the brain is decreased. A potent increase in cerebral ^{14}C activity coincided with the appearance of MCPA intoxication, which suggests that the central nervous system (CNS) is involved in the toxicity of chlorophenoxyacetic acids. (Author abstract by permission)

80-3243. Abou-Donia, M. B. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Metabolism and pharmacokinetics of a single oral dose of *O*-4-bromo- 2,5-dichlorophenyl *O*-methyl phenylphosphonothioate (leptophos) in hens.** *Toxicol. Appl. Pharmacol.* 55(1): 131-145; 1980 (34 references).

The metabolism and pharmacokinetics of a subneurotoxic dose of leptophos were determined in laying hens following a single oral dose of 50 mg/kg (0.9 μCi/hen) of [phenyl^{14}C]leptophos (*O*-4-bromo-2,5- dichlorophenyl *O*-methyl [^{14}C]phenylphosphonothioate). This study adds confirmatory evidence to the hypothesis that species selectivity for delayed neurotoxicity is related to interspecies differences in pharmacokinetics and metabolism. Oral leptophos was metabolized and excreted slowly in hens. The major portion of the radioactivity (86.5%) was excreted during the 20-day experiment. Significant amounts of the dose were deposited in egg albumen and yolk; 3.4 and 2.5%, respectively. Only 1.3% was excreted in expired CO_2. Radioactivity in tissues reached a peak of 14.6% of the dose 12 hr after administration; radioactivity decreased to 6.2% after 20 days (42.6% of peak value). The highest ^{14}C concentration was present in the bile, followed by the gall bladder, kidney, adipose tissue, and liver. Brain, spinal cord, and sciatic nerve, which are affected by the neurotoxicity of leptophos, had smaller but constant concentrations throughout the experiment. Following the oral administration of [^{14}C]leptophos the change in the ^{14}C body burden with time was biexponential. The physiological disposition of leptophos may therefore be defined in terms of a two-compartment open-system model. Radioactivity was excreted at a slow rate, β value of 0.05/day, corresponding to a half-life of 12.0 days. Leptophos was the only compound identified in nerve tissues, muscle, fat and blood. Most of the radioactive substances in the excreta and liver were identified as unchanged leptophos with minor amounts of polar metabolites. The metabolic fate of leptophos can be explained on the basis of its physical properties of lipid solubility and tissue binding, and the predominant biliary secretion and gastrointestinal excretion of the compound.

80-3244. Carlson, G. P. (Dep. Pharmacol. & Toxicol., Sch. Pharm. & Pharm. Sci., Purdue Univ., West Lafayette, IN 47907) **Induction of xenobiotic metabolism in rats by brominated diphenyl ethers administered for 90 days.** *Toxicol. Lett.* 6(3): 207-212; 1980 (17 references).

Diphenyl ethers were administered for 90 day periods to rats at dose levels of 0.78, 1.56, 3.13, 6.25, 12.5 or 25 μmol/kg/day. Doses of 1 μmol/kg/day given over a 90 day period caused increases in metabolism of EPN and *p*-nitroanisole. Depending on the dose used, some of the changes were still observable 30-60 days after the last treatment. This extended period of induction gives some indication of the strength of the inducers, in such sites as adipose tissue and liver.

80-3245. Purser, D. A.; Rose, M. S. (Dep. Inhalat. Toxicol., Huntingdon Res.Cent., Huntingdon, Cambridgeshire, England) **The toxicity and renal handling of paraquat in cynomolgus monkeys.** *Toxicology* 15(1): 31-41; 1979 (17 references).

Studies using cynomologus monkeys were performed to determine toxicity and renal functioning following exposure to paraquat (PQ). Male monkeys were given injections ranging from 6 to 40 mg/kg and oral doses ranging from 45 to 85 mg/kg; all were single doses. One group received 85 mg PQ^{2+}/kg (containing 500 μCi [^{14}C]PQ) orally. Of the animals dosed intravenously, 7 of 9 died within 3 days and 1 died after 9 days; the 6 mg dose was not lethal. The 45 mg/kg oral dose did not prove fatal, but all other oral doses eventually killed all test animals. Clinical signs consisted of vomiting, anorexia and dyspnea. Acute renal failure was accompanied by oliguria, high plasma urea and SGPT levels, and metabolic acidosis. The oral doses proved to be less severe than the injections. Following oral doses, plasma levels peaked by 2 hr and were constant from 12 to 24 hr. Renal clearance fell off markedly after 14 hr as renal failure developed. Pulmonary damage accompanied

renal failure as the cause of death, and interstitial pulmonary fibrosis was associated with surviving the acute phase.

80-3246. Egekeze, J. O.; Oehme, F. W. (Comp. Toxicol. Lab., Kansas State Univ., Manhattan, KS 66506) **Inorganic and organic fluoride concentrations in tissues after the oral administration of sodium monofluoroacetate (compound 1080) to rats.** *Toxicology* 15(1): 43-53; 1979 (22 references).

The concentrations of organic and inorganic fluoride were determined in various tissues after oral dosage of sodium monofluoroacetate (SMFA) to rats. Male rats were given doses of 0.0, 2.3, 3.5, 4.0, 5.0 or 7.0 mg SMFA/kg body wt and were sacrificed if death did not occur up to 5 hr after dosing. Animals were observed for convulsions, and samples of blood, liver, kidney, and stomach were taken. Ionic fluoride concentrations were higher in all tissues and plasma in the treatment groups. The liver had the highest levels, followed by kidney, then plasma. Plasma and kidney had the highest levels of SMFA (15.24 μg/ml and 14.72 μg/g, respectively). Lethal concentrations of SMFA in the stomach content was from 84.9 to 189 μg/ml. SMFA and total fluoride concentrations should be high in SMFA poisoned animals; however, clinical signs, necropsy findings and a history of exposure and additional criteria for diagnosis of SMFA poisoning.

80-3247. Angevine, L. S.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Chlorphentermine uptake by rabbit lung slices.** *Toxicology* 16(2): 139-152; 1980 (26 references).

Slices of rabbit lung tissue were used in studies designed to examine the pulmonary uptake mechanism, accumulation and binding of chlorphentermine (CP). The tissue was incubated in a buffer solution in the presence of 0.25 mM [^{14}C]CP, with incubation medium and tissue being analyzed for radioactivity after various intervals. CP uptake reached a steady state equilibrium after 30 min of incubation. CP uptake was seen to decrease when LiCl was substituted for NaCl in the incubation medium, when K^+ content in the medium was increased, or when slices were incubated with Na^+-pump inhibitors. In addition, CP uptake was inhibited by incubation at 10°C with dieldrin, chloroamphetamine, desimipramin, imiprime, morphine, chlorpromazine, methadone and amphetamine. The results suggest a partially Na^+-dependent uptake process coupled with a diffusion and binding process. Paraquat slightly decreased CP uptake indicating the possibility of a cationic mechanism of uptake. It is suggested that both mechanisms are operational and must be further compared.

80-3248. Perocco, P.; Fini, A. (Ist. Patol. Gen., I-40100 Bologna, Italy) **Damage by dichlorvos of human lymphocyte DNA.** *Tumori* 66(4): 425-430; 1980 (17 references).

The effects of the insecticide dichlorvos on the DNA of human lymphocytes was determined. Human blood was collected and the lymphocytes were separated and cultured in the presence and absence of the pesticide. Test concentrations were 5, 15, 31, 62, 125, 250 and 500 μg/ml. Ultraviolet irradiation tests were performed to determine DNA repair efficiencies in the presence of the pesticide. Tritiated thymidine was used to measure the unscheduled or scheduled DNA synthesis. It was shown that this pesticide affects scheduled (semiconservative) DNA synthesis. It was also demonstrated that DNA-induced low reparative synthesis was damaged. The UV studies showed that after damage, the pesticide interfered with repair processes.

80-3249. Dandliker, W. B.; Hicks, A. N.; Levison, S. A. (Scripps Clin. & Res. Found., La Jolla, CA) **Effects of pesticides on the immune response.** *US NTIS PB Rep.* PB-130,834: 52 pp.; 1980 (20 references).

The influence of various pesticides on the humoral and cellular immune response to fluorescein labeled ovalbumin has been analyzed. Pesticides [Aroclor 1260, dinoseb, parathion, pentachloronitrobenzene (quintozene), piperonyl butoxide, mixed pyrethrins and resmethrin] were administered ig in corn oil in 1 dose (0.5 LD50) before primary immunization. Control groups included those treated with corn oil alone or immunosuppressed with Methotrexate. Booster immunizations and test bleedings were scheduled at weekly intervals thereafter. The cellular immune response was quantified by redness and swelling, histological examination and by differential temperature measurements of the foot pads after antigen challenge. The concentration, binding affinity and heterogeneity of the serum antibody were determined by fluorescence polarization measurements. Dinoseb and parathion depressed both the humoral and cellular responses. Methotrexate and pentachloronitrobenzene give a late stimulation, while resmethrin an early, sometimes very marked stimulation of the cellular immune response. Other pesticides showed little or no effect under the conditions tested. Effects on the humoral response were limited to changes in antibody concentration, the binding affinity being nearly constant in all instances. (Author abstract by permission)

80-3250. Simmon, V. F. (SRI Int., Menlo Park, CA) ***In vitro* microbiological mutagenicity and unscheduled DNA synthesis studies of eighteen pesticides.** *US NTIS PB Rep.* PB-133,226: 177 pp.; 1980 (29 references).

Eighteen pesticides being reviewed as a part of the EPA Substitute Chemical Program were tested for

mutagenic activity by the following *in vitro* procedures: reverse mutation in *Salmonella typhimurium* strains TA 1535, TA 1537, TA 1538, TA 98 and TA 100 and in *Escherichia coli* WP2 uvrA; induction of mitotic recombination in the yeast *Saccharomyces cerevisiae* D3; relative toxicity assays in DNA repair-proficient and -deficient strains of *E. coli* (strains W3110 and p3478, respectively) and of *Bacillus subtilis* (strains H17 and M45 respectively); and unscheduled DNA synthesis (UDS) in human fibroblasts (WI-38 cells). Nine of the 18 pesticides were mutagenic in one or more of the assays. One compound, demeton, was mutagenic in all of them. Trichlorfon was mutagenic in all the assays except those for relative toxicity. Acephate was mutagenic in the *Salmonella typhimurium* in TA 100, *Saccharomyces cerevisiae* D3, and UDS assays. Dicamba, 2,4-D acid, 2,4-DB acid, and propanil were positive only in the assay for relative toxicity. Disulfoton was positive only in the UDS assay, and then only in the absence of the metabolic activation system. Crotoxyphos was positive only in the *S. cerevisiae* D3 assay. (Author abstract by permission)

80-3251. Trifonova, T. K.; Gladenko, I. N. (Ukrainian Res. Inst. Exp. Vet. Sci., USSR) **Opredelenie gonado- i embriotoksichnosti pestitsidov. [Determination of gonado- and embryotoxicity of pesticides.]** *Veterinariya (Moscow)* 6: 58-59; 1980 (Russian).

The gonadotoxicity and embryotoxicity of the pesticides heptachlor and kelthane were studied in albino rats. Female rats were kept on a diet containing pesticides at 0.01 and 0.005 LD50 for 2 mo. After termination of exposure, females were mated and the number of inseminated females was estimated. After exposure to kelthane the per cent of inseminated females was 5-7 fold lower than that in controls. The gonadotoxicity of heptachlor was less pronounced. Exposure to kelthane and heptachlor resulted in death and resorption of some embryos.

80-3252. Zhavoronkov, N. I.; Antsiferov, S. D.; Evdokimov, S. M. (All-Union Res. Inst. Exp. Vet. Sci., USSR) **Vliyanie polikarbatsina na organizm zhivotnykh. [Effect of polycarbacine on animals.]** *Veterinariya (Moscow)* 6: 59-61; 1980 (Russian).

Toxicity of the fungicide polycarbazine [zineb-ethylenebis(thiuram disulfide) mixed precipitation] was studied in albino mice, rabbits, chickens and sheep. The LD50 value after po or intragastric administration was 2630 mg/kg for mice, 620.0 mg/kg for rabbits, 7660 mg/kg for chickens, and 1000 mg/kg for sheep. Feeding of mice with diet containing 0.01 LD50 for 45 days before mating and during the gestation period had no gonadotoxic, embryotoxic, or teratogenic effect. The mechanism of acute poisoning with polycarbazine is associated with dehydrogenase inhibition. Polycarbazine residues could be detected in organs and tissues of sheep and chickens for 10-15 days.

80-3253. Padalkin, I. Ya. (All-Union Res. Inst. Noncontagous Dis. Anim., USSR) **Toksichnost' akreksa dlya ovets. [Toxicity of acrex to sheep.]** *Veterinariya (Moscow)* 6: 61-63; 1980 (Russian).

The chronic toxicity of the acaricide acrex (dinobuton) was studied in sheep. The animals received fodder containing 30% emulsifiable concentrate of acrex for 2 mo; the daily dose of acrex was 35 mg/kg (group 1), 16.6 mg/kg (group 2), or 8.3 mg/kg (group 3). On day 21 after termination of acrex administration, animals were sacrificed, and the internal organs and tissues were subjected to pathoanatomical examination. Prolonged feeding with acrex induced hyperemia of oral mucosa, splotchy liver coloring, catarrhal inflammation of the stomach and intestine, hemorrhagic foci in the heart muscle, and atrial hypotrophy. Exposure to acrex resulted in a decrease of the RBC count and total protein in the blood serum. Thin layer chromatography showed acrex residues in muscles and liver tissue.

80-3254. Niblett, P. D.; McKeown, B. A. (Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, Ontario, Canada) **Effect of the lamprey larvicide TFM (3-trifluoromethyl-4-nitrophenol) on embryonic development of the rainbow trout *(Salmo gairdneri,* Richardson).** *Water Res.* 14(5): 515-519; 1980 (20 references).

Toxicity studies were performed to determine the effects of the lampricide TFM on rainbow trout. Trout eggs were exposed to several different concentrations of the compound for 24 hr, transferred to clean water, and then mortality and hatching were monitored for 50 days. Mortality after 24 hr exposure was negligible for exposures of 2, 4, or 8 mg/l. After 7-10 days, egg mortality rose to 30% at the 4 mg level and climbed to 50% after 50 days. The 8 mg level caused almost 100% mortality in 50 days. This delayed effect coincides with the onset of neurulation. When larvae were exposed to TFM after neurulation occurred, mortality was reduced. Young trout are not necessarily safe from the minimal application levels of the lampricide.

80-3255. Poels, C. L.; van der Gaag, M. A.; van de Kerkhoff, J. F. J. (Netherlands Waterworks' Testing & Res. Inst., NL-2280 AB, The Netherlands) **An investigation into the long-term effects of Rhine water on rainbow trout.** *Water Res.* 14(8): 1029-1035; 1980 (30 references).

Studies were performed to determine the effects of water from the Rhine River on rainbow trout. Trout were placed in either ground water or Rhine water in continuous flow systems. Growth was determined monthly. At 1, 3, 6, 9, 12, 15 and 18 mo, 20-30 trout were randomly collected and analyzed for tissue abnormalities and blood chemistry. The experimental group exhibited 40% weight reductions and 15% length reductions. The liver somatic index was 55% higher between mo 3 and 6. Kidney enlargement of the experimental group was 35% after mo 9. Hemoglobin

was significantly reduced by about 30% after 18 mo and the blood glucose level was 50% higher after 18 mo. A significantly higher level of chlorinated hydrocarbons [HCB (hexachlorobenzene), DDE, PCB, QCB (quintozene), dieldrin, TDE and DDT] accumulated in the adipose tissue. Histological changes occurred in the liver and spleen due to exposure to Rhine water. The authors include that the Rhine water is chronically toxic to rainbow trout.

80-3256. Holcombe, G. W.; Fiandt, J. T.; Phipps, G. L. (Environ. Res. Lab., US EPA, Duluth, MN 55804) **Effects and pH increases and sodium chloride additions on the acute toxicity of 2,4-dichlorophenol to the fathead minnow.** *Water Res.* 14(8): 1073-1077; 1980 (18 references).

Studies showed that changes in the pH altered the toxicity of 2,4-dichlorophenol on fathead minnows. A continuous flow system was used to deliver a range of concentrations from 0.3 to 8.8 mg/l to 41 *l* tanks holding 50 31-day-old minnows. The pH was controlled by additions of NaOH. When the pH was increased from 7.57 to 8.25, the average 96-hr survival went from 60% to 100%. The survival at 192 hr went from 28% at pH 7.57 to 100% when the pH was raised to 9.08. Additions of NaCl had no noticeable effect on the toxicity of 2,4-dichlorophenol. Schooling behavior was altered at all pH levels.

80-3257. Hansen, C. R., Jr.; Gauss, J. D.; Kawatski, J. A. (Dep. Biol., Viterbo Coll., LaCrosse, WI 54601) **Whole-body distribution and Malpighian tubule transport of 2′,5-dichloro-4′-nitrosalicylanilide (Bayer 73) and 3-trifluoromethyl-4-nitrophenol in larvae of the aquatic midge *Chironomus tentans*.** *Xenobiotica* 10(4): 257-263; 1980 (10 references).

Residues of the lampricides ^{14}C-Bayer 73 (2′,5-dichloro-4′-nitrosalicylanilide clonitralid) and ^{14}C-TFM (3-trifluoromethyl-4-nitrophenol) were absorbed from aqueous sublethal concentrations by aquatic larvae of the midge *Chironomus tentans*. Toxicant residues were widely distributed during early hours of exposure, but later and during a 24 hr post-exposure period, they became concentrated in the trunk and intestinal tract. The posterior movement of Bayer 73 were more rapid than that of TFM. During 4 hr tests, Malphigian tubules of the chironomid actively transported Bayer 73 and TFM *in vitro*, and on a per tubule basis, more TFM was transported than Bayer 73. Potassium cyanide inhibited tubule transport. Serotonin had no effect. (Author abstract by permission)

80-3258. Elstner, E. F.; Osswald, W. (Inst. Bot. & Mikrobiol., Techn. Univ. Munchen, D-8000 Munich 2, BRD) **Chlorophyll photobleaching and ethane production in dichlorophenyldimethylurea- (DCMU) or paraquat-treated *Euglena gracilis* cells.** *Z. Naturforsch. Teil C* 35(5-6): 129-135; 1980 (33 references).

Studies were performed on the production of ethane and chlorophyll photobleaching in Euglena cells treated with DCMU (monuron) or paraquat. Bleaching was stimulated by 10^{-5} *M* DCMU and 10^{-3} *M* paraquat, and was accompanied by the formation of thiobarbituric acid and ethane. A 10^{-4} *M* concentration of DBMIB (dibromothymoquinone) or 25 m*M* sodium bicarbonate partially prevented both the photobleaching and ethane production. Cell-free extracts were used to determine that the primary reaction for ethane formation and photobleaching was the oxidation of α-linoleic acid by excited chlorophyll.

See also 80-3003, 80-3004, 80-3005, 80-3007, 80-3008, 80-3011, 80-3012, 80-3014, 80-3016, 80-3017, 80-3019, 80-3020, 80-3021, 80-3022, 80-3025, 80-3026, 80-3029, 80-3032, 80-3033, 80-3035, 80-3038, 80-3039, 80-3040, 80-3041, 80-3042, 80-3043, 80-3044, 80-3048, 80-3050, 80-3052, 80-3053, 80-3057, 80-3061, 80-3064, 80-3074, 80-3085, 80-3098, 80-3106, 80-3115, 80-3116, 80-3118, 80-3122, 80-3124, 80-3126, 80-3127, 80-3128 *and* 80-3131.

80-3259. Janalik, B. (Inst. Vertebr. Res., CSAV, Brno, Czechoslovakia) **Stanoveni obsahu fosfidu zinku v rodenticidni nastraze Stutox. [Determination of the zinc phosphide content in the rodenticide bait Stutox.]** *Agrochemia* 20(6): 183-184; 1980 (5 references) (Czech).

The quantitative determination of zinc phosphide in the Czechoslovakian rodenticide Stutox (widely used to control *Microtus arvalis*) is based on the liberation of phosphine from the bait with dilute sulfuric acid and its absorption in potassium permanganate. The consumption of permanganate corresponding to the quantity of zinc phosphide in the weighed sample is determined by titration with oxalic acid. The mean content of Zn_3P_2 found in Stutox was 5.78% ± 1.11%. [Paper presented at the 1978 ASTM Vertebrate Pest Control & Management Materials Symposium]

80-3260. Walton, H. F. (Univ. Colorado, Boulder, CO 80309) **Ion exchange and liquid column chromatography.** *Anal. Chem.* 52(5): 15R-27R; 1980 (569 references).

This review covers published reports from the last 2 yr concerning liquid chromatography. Information is presented on ion exchange in reference to inorganic exchangers, chelating and special resins, solvent-modified polymers, ligand exchange, mobile-phase separation or optical isomers, isotope separation, and nonchromatographic uses. Liquid column chromatography information includes topics such as stationary phases, solvents, gradient elution, columns, microscale columns, detectors, and paired-ion chromatography. Special applications discussed include organometallic compounds, preparative liquid chromatography, trace organic compounds in water, and measuring the solubilities of sparingly soluble organic compounds.

80-3261. Wasson, J. R.; Salinas, J. E. (Ellestad Res. Lab., Lithium Corp. America, Bessemer City, NC 28016) **Nuclear magnetic resonance spectrometry.** *Anal. Chem.* 52(5): 90R-95R; 1980 (257 references).

This review covers published literature from July 1977 to July 1979 concerning developments in nuclear magnetic resonance spectrometry. Information is provided on apparatus and techniques, spectral analysis, computer applications, analytical applications, selected organic systems, and selected inorganic systems.

80-3262. Burlingame, A. L.; Derrick, P. J.; Chizhov, O. S. (Biomed. Mass Spectrom. Resour., Space Sci. Lab., Univ. California, Berkeley, CA 94720) **Mass spectrometry.** *Anal. Chem.* 52(5): 214R-258R; 1980 (1421 references).

This literature review describes developments in the field of mass spectrometry made over the past few years. Major topics included in the review are innovative techniques and instrumentation, chromatographic/mass spectrometric/on-line computer techniques, mass spectral interpretation and management techniques, fundamentals of ion chemistry, appearance energies, laser spectroscopy, electron impact (EI) mass spectra, field ionization and field desorption, metastable ions, mass spectrometry/mass spectrometry, ion cyclotron resonance, chemical ionization and other high pressure techniques, bio-oligomers and their constituents, biomedical applications, pharmacology and toxicology, biochemistry applications, clinical chemistry applications, and applications in the field of human and other biological toxic environmental exposure. Particular mention is made of articles dealing with the utility of mass spectrometry in identifying pesticides and pesticide residues.

80-3263. Zweig, G.; Sherma, J. (Off. Pestic. Programs, US EPA, Washington, DC 20460) **Paper and thin-layer chromatography.** *Anal. Chem.* 52(5): 276R-289R; 1980 (549 references).

This review covers the literature on paper and thin-layer chromatography appearing from December 1977 through November 1979. Specific topics included in this review are chromatographic systems, techniques and apparatus, detection and identification of separate zones, and quantitative analysis. Information is given on the application of the methods to various chemicals, including pesticides. Recent advances in the analysis of pesticides include *p*-nitrobenzyl esters of gibberellins, organophosphorus and carbamate pesticides, residue analysis of triazine herbicides such as metribuzin, and the use of densitometry for triforine, α-HCH (α-BHC), captan, captafol, fenitrothion, carbaryl, patulin, metoxuron, and thiourea.

80-3264. Cram, S. P.; Risby, T. H.; Field, L. R.; Yu, W. L. (Walnut Creek Div., Varian Instr. Group, Walnut Creek, CA 94598) **Gas chromatography.** *Anal. Chem.* 52(5): 324R-360R; 1980 (1370 references).

This review surveys the fundamental developments in the field of gas chromatography during the years 1978-1979. Topics included in the review are gas chromatography in the Peoples Republic on China, developments in columns, the use of capillary GC, developments in detectors such as the thermal conductivity detectors, flame ionization detectors, electron capture detectors, flame photometric detectors, spectrometric detectors, electrochemical detectors, gas chromatography-mass spectrometry, radiochemical detectors, qualitative and quantitative analyses, methodology including sampling and sample preparation, chemical reactions, derivatization, pyrolysis, preparative scale and trapping, physical-analytical measurement techniques, inorganic GC and novel applications of GC.

80-3265. Melcher, R. G.; Caldecourt, V. J. (Michigan Div. Anal. Lab., Dow Chem. USA, Midland, MI 48640) **Delayed injection-preconcentration gas chromatographic technique for parts-per-billion determination of organic compounds in air and water.** *Anal. Chem.* 52(6): 875-881; 1980 (13 references).

A method of detecting parts-per-billion quantities of organics in air and water samples is described. The compounds are retained in a collection precolumn, while the air or water are vented, thus concentrating the organics. An electron current is applied across the precolumn to heat it and boil off the compounds. The method eliminates the necessity of programming temperature, for sharp peaks can be obtained for the high boiling compounds. This technique offers many advantages: direct injection of water samples, which would destroy many gas chromatographic columns, is possible; low levels of contaminants can be detected; and compounds that are difficult to extract from water can be detected. Furthermore, all types of detectors can be used in this system.

80-3266. Kuehl, D. W.; Whitaker, M. J.; Dougherty, R. C. (Environ. Res. Lab., US EPA, Duluth, MN 55804) **Micromethods for toxic residue screening by negative chemical ionization mass spectrometry.** *Anal. Chem.* 52(6): 935-940; 1980 (10 references).

Methods were developed for the analysis of polychlorinated chemical residues found in milligram quantities of biological samples (including heptachlor epoxide, chlordane, *p,p'*-DDE, *p,p'*-DDT and PCP). Sample preparation by micro continuous liquid-liquid extraction steam distillation or by micro gel-permeation chromatography gave sufficiently clean residue extracts for negative chemical ionization analysis. With these techniques, chemicals such as chlorophenols and chlorobiphenyls have been confirmed in human adipose samples as small as 12.5 mg. These methods make it possible to screen < 1 g samples of biological substrates for contamination with persistent toxic substances at the part per billion level. (Author abstract reprinted by permission of the American Chemical Society)

80-3267. Esposto, R.; Camoni, I.; Chiacchierini, E.*; Magri, A. (Ist. Policattedra Chim. Anal. & Spettrosc., Univ. Sassari, Sassari, Italy) **Determination of triphenyltin compounds and tricyclohexyltin hydroxide by gas-chromatography of their derivatives.** *Ann. Chim. (Rome)* 68(3-4): 235-245; 1978 (24 references).

The determination of triphenyltin derivatives (Ph_3SnR) and tricyclohexyltin ($CySnOH$) in laboratory prepared mixtures and in pesticidal powders by gas chromatography is described. The triphenyltin derivatives and the tricyclohexyltin hydroxide are converted through a CuCl catalyzed Grignard reaction to tetraphenyltin (Ph_4Sn) and tricyclohexylphenyltin (Cy_3PhSn) derivatives. Ph_4Sn and Cy_3PhSn were recovered satisfactorily in the range of 50-3000 μg. After alumina column cleanup, eluates were subjected to gas-liquid chromatography or infrared spectroscopy, mass spectrometry and thermal analysis for comparison. Different glass columns were also tried with flame ionization detection. The method was found to be sensitive and specific for detection and determination of organotin compounds from pesticide powders of known composition.

80-3268. Johns, B. E. (Denver Wildl. Res. Cent., US Fish & Wildl. Serv., Denver, CO 80225) **Acute toxicant identification in whole bodies and baits without chemical analysis.** *ASTM STP 693* pp. 80-88; 1978 (13 references).

A toxicant color coding system based on the standard color code of the electronics industry was tried to easily identify toxicants in digestive tracts and fecal samples without chemical analyses. Small, color-coded, chemically stable plastic particles were incorporated into various baits containing such compounds as zinc phosphide, 1080 compound (sodium fluoroacetate), diphacinone, Starlicide (DRC-1339), and Avitrol (aminopyridine). The plastic particles did not elicit bait aversion when tested in coyotes, Norway rats, Richardson's ground squirrels, white-footed deer mice, blackbirds or starlings. Code integrity was maintained under a variety of conditions. Toxicant identification was also successful in coyotes poisoned secondarily by eating contaminated rodents. Recovery of color-coded particles was easy by the use of one or more layers of fluorescent or ferromagnetic materie[1]. The system allows for distinct color codes numbering in the millions and is recommended for use in the manufacturing of toxic baits. [Paper presented at the 1978 ASTM Avian & Mammalian Wildlife Toxicology Symposium]

80-3269. Milillo, M. A. (Ist. Chim., Fac. Med. Vet., Univ. Bari, Bari, Italy) **Determinazione dei residui di pesticidi organo-clorurati in alcuni mangimi usati nell'alimentazione degli animali domestici. [Determination of organochlorine pesticide residues in some feeds used in the diet of domestic animals.]** *Boll. Soc. Ital. Biol. Sper.* 54(24): 2518-2521; 1978 (5 references) (Italian).

A gas chromatographic method for determining organochlorine pesticide residues in animal feeds and results of analyses by this method are reported. Following trituration of the sample in hexane, the residue was extracted with hexane in a Soxhlet apparatus, the extract was washed repeatedly with a water-ethanol mixture, re-extracted with acetonitrile and again with hexane. The extracts were cleaned up on a Florisil column. A gas chromatograph equipped with an electron capture detector was used for the determination, using 10% Anakrom ABS 70-80 LA as a stationary phase, a column temperature of 200°C, an injector temperature of 220°C, and nitrogen as the carrier gas. Fourteen of the samples analyzed contained

0.0352-0.1513 ppm of lindane, 6 samples contained heptachlor (0.0003-0.0752 ppm), all samples contained aldrin (0.0013-0.1203 ppm), 10 samples contained dieldrin (0.0007-0.0512 ppm), 5 samples contained *o,p'*-DDT (0.0002-0.0171 ppm), and 10 samples contained *p,p'*-DDT (0.0007-0.2301 ppm).

80-3270. Miyazaki, T.; Akiyama, K.; Kaneko, S.; Horii, S.; Yamagishi, T.; Kodera, K. (Tokyo Metrop. Res. Lab. Public Health, 24-1, 3-chome, Hyakunincho, Shinjuku-ku, Tokyo, Japan) **Gas chromatographic method for the determination of residues of chlordanes and related compounds in fish and shellfish.** *Bull. Environ. Contam. Toxicol.* 25(2): 305-312; 1980 (10 references).

An electron capture gas chromatographic method is presented for routine analysis of chlordanes in fish and shellfish in the presence of PCBs and common organochlorine pesticides. Florisil column chromatography of the sample extract gives a *trans*-nonachlor fraction and the other chlordane fractions. The interference with other organochlorines is also eliminated. The fractions are then subjected to electron capture gas chromatography. Field samples were collected from Tokyo Bay. Minimum detectable levels by this method were about 0.2 and 0.1 ppb for *cis*-nonachlor and the other chlordanes, respectively.

80-3271. Huber, J. F. K.; Fogy, I.; Fioresi, C. (Inst. Anal. Chem., Univ. Wien, A-1090 Vienna, Austria) **Residue analysis by multicolumn liquid chromatography – herbicides in cereals.** *Chromatographia* 13(7): 408-412; 1980 (15 references).

Multicolumn high pressure liquid chromatography was used to determine residues of a new herbicide and its major metabolite. The herbicide was *O*-[3-phenyl-6-chloropyridazinyl-(4)]-*S*-(*n*-octyl)-thiocarbonate. The main metabolite is the phenolic compound 3-phenyl-4-hydroxy-6-chloropyridazine, occurring in the plant in the free form as well as bonded to carbohydrates as glycosides. The material to be analyzed was made up of green plants at different growth states and grains and straw of wheat, oat and barley. Green plants and straw are kept deep frozen between harvest and analysis. During preseparation the herbicide and metabolite are continuously extracted from the plant material with acetone. The chemically bound metabolite remains in the solid residue, while the acetone extract contains the entire amount of herbicide plus free metabolite. The free metabolite and herbicide are analyzed separately. The amount of metabolite bonded to the plant carbohydrate material is determined by chromatography following hydrolysis of the solid residue from the first extraction. The lower limit of detection was 0.01 ppm for both the herbicide and the metabolite. Recovery was 50% for the herbicide and 60% for the metabolite.

80-3272. Blaicher, G.; Pfannhauser, W.; Woidich, H. (Forschungsinst. Ernaehrungswirtsch., 1190 Vienna, Austria) **Problems encountered with the routine application of HPLC to the analysis of carbamate pesticides.** *Chromatographia* 13(7): 438-446; 1980 (14 references).

A procedure suitable for the determination of all carbamate pesticides covered by Austrian regulations on pesticide residues is described. The sample to be analyzed is extracted three times with ethyl acetate. Water is added to the combined ethyl acetate extracts, and the ethyl acetate is then evaporated. Methanol is added to the resulting water phase. Extraction with *n*-pentane then removed chlorophylls. The methanol-water layer contains carbamates and the yellow and orange plant pigments, the carotenoids, and xanthophylls. The pigments are eliminated by extracting the methanol-water phase with chloroform and cleaning up the chloroform layer on a Florisil column. The column eluate is evaporated to dryness and diluted to a certain volume. HPLC and GLC analysis are carried out on the isolated material. Knowledge of specific pesticides applied to the test crop or examination of samples with low content of interfering substances may permit simplification of clean-up procedures. According to Austrian regulations, benomyl concentrations must be determined together with those of carbendazim and benzimidazolamine-2. Determination of benomyl and carbendazim is possible by HPLC on silica gel with 76 + 24 isooctane plus dioxane, but benzimidazolamine-2 is not detectable under these conditions. To rectify this problem, the sample is extracted with ethyl acetate, benomyl is hydrolyzed with hydrochloric acid to yield carbendazim, and carbendazim is hydrolyzed with sodium hydroxide to yield benzimidazolamine-2. After extraction, analysis is performed by reversed-phase HPLC.

80-3273. Churchill, F. C., II (Univ. Georgia, Athens, GA) **Part I: carbon-13 nuclear magnetic resonance studies concerning the structure of versiconal acetate. Part II: derivatization of organophosphorus pesticides and related phosphorothioates in the inlet block of a gas chromatograph. Part III. Extractive alkylation of niclosamide for gas-chromatographic analysis.** *Diss. Abstr. Int. B* 41(2): 557; 1980.

The structure proposed previously by other workers for versiconal acetate, a metabolite of such molds as *Aspergillus flavus* and *Aspergillus parasiticus* in the presence of low concentrations of the insecticide dichlorvos, is found to be in error. The correct structure is established with the aid of ^{13}C and ^{1}H nuclear magnetic resonance spectrometry. In the strongly proton accepting solvent d_6-dimethylsulfoxide, versiconal acetate exists as a major and a minor hemiacetal species interconverting through an aldehyde intermediate which itself appears in negligible abundance. The derivatives confirm the structure of versiconal acetate. Trimethylphenylammonium hydroxide in methanol is demonstrated to be a useful reagent for the inlet-block GLC derivatization of not only many

organophosphorus pesticides but also their dialkyl phosphorothioate hydrolysis products. Methyl parathion is shown to derivatize in high yield by an in-block transesterification mechanism, while malathion reacts by rapid β-elimination in solution followed by in-block pyrolytic methylation. Efficiencies are determined for the methylation of potassium *O,O*-dimethyl phosphorodithioate and potassium *O,O*-dimethyl phosphorothioate, and methods for the quantification of these salts are outlined. A sensitive, specific analytical method was developed for analyzing niclosamide formulations and residues. Tetrabutylammonium chloride was used as the phase-transfer agent for extraction (> 85% efficiency of recovery from fortified stagnant water). GLC-ECD detection of the *N,O*-dimethyl derivative permitted the determination of as little as 10 ppb, using the synthesized 5-dechloro analog as internal standard. This method may be useful for the analysis of other polar, acidic pesticides and pesticide metabolites. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8017159)

80-3274. Udovich, G. J. (Univ. Wyoming, Laramie, WY 82070) **An electrochemical investigation of the reduction of DDT in ethanol, acetonitrile and *N,N*-dimethylformamide and the development of a method for the differential pulse polarographic determination of DDT.** *Diss. Abstr. Int. B* 41(2): 561; 1980.

A differential pulse polarographic method for the determination of DDT in ethanol was developed. The peak height of the first DDT reduction peak was found to vary linearly with DDT concentration in the range 0.1 to 500 μ*M*. The limit of detection was 1 μg of DDT in 25 ml of ethanol. The relative standard deviation of DDT determinations was 16% in solution with up to 10 μ*M* DDT and 3% with higher DDT concentrations. Polarographic reduction of DDT in acetonitrile and dimethylformamide was found to occur in 4 distant steps with relative electron numbers of 1, 2, 3 and 2, respectively, indicated by sampled DC polarograms. DC polarograms recorded with natural drop times and various mercury column heights indicated that the first 3 of these steps and probably the fourth were diffusion controlled. Cyclic voltammograms of DDT in acetonitrile and dimethylformamide contained 4 cathodic peaks and the peaks of 2 reversible redox couples. One of the redox couples was attributed to a stable product, Cl^-, and the other to an unstable intermediate. The relationship between the potential scan rate and peak height divided by the square root of the scan rate indicated an ECE mechanism for reduction steps 2, 3 and 4 and an ECE or CE mechanism for step 1. It was proposed that the solvents did not directly participate in the reduction mechanism but that the tetraalkylammonium ions did participate, probably as electron donors. Water in the system was found to affect the transfer coefficient of the last 3 reduction steps. The product of reduction from each step was prepared by controlled potential electrolysis in acetonitrile. The products were isolated and identified spectroscopically. Structures were assigned to 3 of the products. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8018023)

80-3275. Krasnykh, A. A.; Pavlova, L. G. (All-Russian Res. Inst. Plant Prot., Ramon', Voronezh Oblast', USSR) **Khromatograficheskoe opredelenie detsisa v rasteniiakh, vode i pochve. [Chromatographic determination of Decis in plants, water, and soil.]** *Gig. Sanit.* 45(5): 62-63; 1980 (Russian).

A thin-layer chromatographic method was developed for determining residues of the insecticide Decis (decamethrin) in environmental samples. Soil, water or plant samples are extracted with *n*-hexane by shaking vigorously. Hexane extracts are filtered through a layer of anhydrous sodium sulfate, the solvent evaporated, and the residue taken up again in *n*-hexane. The samples are spotted onto chromatoplates and run with chloroform-hexane (3:1) and acetone-hexane (2:5) solvent systems. Decis is detected by spraying the developed plates with a 0.5% solution of ammoniacal silver or a saturated solution of diphenylamine in acetone, followed by UV irradiation. The test spot is compared with a reference spot. The sensitivity of the method is 3-5 μg/sample.

80-3276. Krasnykh, A. A.; Pavlova, L. G. (All Russian Res. Inst. Plant Prot., Ramon', USSR) **Khromatograficheskoe opredelenie mil'go v vode pochve i rasteniyakh. [Chromatographic determination of Milgo in water, soil, and plants.]** *Gig. Sanit.* 45(6): 69-70; 1980 (Russian).

A determination method for the fungicide Milgo (2-ethylamino-4- oxy-5-butyl-6-methyl- pyrimidyl; ethirimol) in water, soil and plants is described. The technique consists of extraction of the fungicide with organic solvent, purification of the extract, and chromatographic fractionation in a thin layer of silica gel. Sensitivity of the method is 2 μg for water and μg for soil and plant specimens. Extractability is 95% for water and 83-85% for soil and plant specimens.

80-3277. Komora, F.; Popl, M.; Smejkal, F. (Natl. Wood Res. Inst., Bratislava, Czechoslovakia) **Analytische Bewertung der zum Holzschutz verwendeten Organozinnverbindungen. [Analytical evaluation of organotin compounds used for wood preservation.]** *Holztechnologie* 20(1): 26-29; 1979 (9 references) (German).

The suitabilities of various methods for determining organotin compounds used as wood preservatives were tested. Gas chromatography is suitable for the analysis of butyltin, alkyltin, and phenyltin halides. Paper

chromatography, using pyrocatechol violet for development after UV irradiation, is suitable for the determination of organotin compounds. IR spectroscopy is unsuitable for the quantitative determination of organotin wood preservatives in their mixtures. UV spectroscopy is unsuitable for the analysis of butyltin chloride. Thin-layer chromatography was found suitable for the quantitative and semi-quantitative determination and identification of organotin compounds. Gel chromatography can be used to identify impurities, but not to analyze mixtures of organotin compounds.

80-3278. Barendsz, A. W. (Chem. Lab., Natl. Def. Res. Organ. TNO, Lange Kleiweg 137, Rijswijk (ZH), The Netherlands) **A detection tube for cholinesterase inhibiting compounds.** *Int. J. Environ. Anal. Chem.* 6(2): 89-94; 1979 (1 reference).

2,6-Dichloroindophenyl acetate, normally orange-red in color, is transformed into a deep blue alcohol by the action of the enzyme butyrylcholinesterase from horse serum. When the serum is inactivated, this color change does not occur. This reaction has been used to make an inexpensive and simple, yet highly sensitive and specific detection tube comprised of a breakable ampule with an aqueous buffer solution, a freeze-dried preparation of the chromogenic ester with a filler promoting its dissolution, a freeze-dried preparation of butyrylcholinesterase with a filler promoting its stability, and an indication layer. DDVP (dichlorvos) was detected at concentrations as low as 0.4 mg/cubic meter, when the sampled air volume is 2 ℓ.

80-3279. Sherman, L. R.; Carlson, T. L. (Dep. Chem., Univ. Akron, Akron, OH 44325) **A modified phenylfluorone method for determining organotin compounds in the ppb and sub-ppb range.** *J. Anal. Toxicol.* 4(1): 31-33; 1980 (10 references).

An analytical method is reported with sensitivity in the μg range for determining organotin compounds. The method presented is a modification of the phenylfluorone method for tin analysis. Two extractions of an aqueous solution containing bis(tri-n-butyltin) oxide and tin sulfate yield results quantitative for the oxide without interference from the tin sulfate. Extracts are wet oxidized with hydrogen peroxide and sulfuric acid. Tin is determined as its complex with 2,6,7-trihydroxy-9-phenylisoxanthane-3-one. The method is reliable for water, soil, or aquatic life.

80-3280. Broetell, H.; Ahnfelt, N. O.; Ehrsson, H.; Eksborg, S. (Res. Dep., Anal. Chem., AB KABI, S-112 87 Stockholm, Sweden) **Electron capture gas chromatography with splitless injection on isothermally operated wide-bore glass capillary columns.** *J. Chromatogr.* 176(1): 19-24; 1979 (5 references).

The injection of large volumes (up to 50 μℓ) of diluted sampled into a wide-bore isothermally operated glass capillary column has been studied. A series of *n*-alkanes (C_{11}-C_{16}) have been evaluated as sample solvents by measurement of the resolution between the pesticides *p,p'*-DDD (*p,p'*-TDE) and *o,p'*-DDT. Variations in retention time for the solutes injected in different solvents and in different volumes of the same solvent have been measured. The effect on resolution of changing the injector port temperature has been studied at a constant column temperature of 210°C. A double-injection technique utilizing a combination of a high-boiling (C_{15}) and a low-boiling (C_6) *n*-alkane solvent is described. More than 500 injections with sample volumes of 5 μℓ have been made on a 0.77 mm I.D. SE-30 column without significant deterioration of its performance. (Author abstract by permission)

80-3281. Vessman, J. (AB Hassle, S-431 83 Molndal, Sweden) **Quantitation of non-halogenated compounds by electron-capture gas chromatography.** *J. Chromatogr.* 184(3): 313-324; 1980 (61 references).

The use of electron-capture gas chromatography for the quantitation of non-halogenated compounds that do not contain a nitro group (such as carbonyl compounds, fumaronitrile and azobenzene) is reviewed. The electrophore most often used is the conjugated carbonyl group; about 15 examples (including the anticoagulant warfarin) are given on selective and sensitive determinations. Sulfonamide-containing compounds represent another interesting group useful for quantitative work. Finally some electrophore compounds belonging to various classes are mentioned (including one pyrethroid insecticide). (Author abstract by permission, modified)

80-3282. Cole, E. R.; Crank, G.; Hai Minh, H. T. (Dep. Appl. Org. Chem., Univ. New South Wales, Kensington, New South Wales 2033, Australia) **Chromatography of 1,3-benzodioxole derivatives.** *J. Chromatogr.* 193(1): 19-28; 1980 (7 references).

Study of the gas-liquid chromatography and high-performance liquid chromatography of 2-alkyl- and 2,2-dialkyl-benzodioxoles and their ring-substituted derivatives (including sesamin and sesamolin, 2 synergists of pyrethrum insecticides) gave exponential relationships bween retention values and carbon chain length of the substituents. The influence of the substituents on the benzene ring was evaluated for a variety of derivatives. An equation is presented relating the retention value of a derivative with that of its parent, and involves a constant due to the effect of the substitute. Separation by thin-layer chromatography does not display an exponential relationship of the above type. (Author abstract by permission)

80-3283. Robinson, J. R.; Chapman, R. A. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Determination of carbofuran residues in potato, onion and turnip: comparative analyses using gas chromatography-selected ion monitoring or high-performance liquid chromatography.** *J. Chromatogr.* 193(2): 213-224; 1980 (5 references).

Potato, onion and turnip were analyzed for residues of carbofuran, 3-hydroxycarbofuran and 3-ketocarbofuran to 0.01 ppm by separation and quantitation of heptafluorobutyryl (HFB) derivatives using gas chromatography-chemical ionization mass spectrometry with selected-ion monitor detection at 228 a.m.u. Extracts of acid-digested crops (5 g/ml) required cleanup by liquid-solid chromatography and treatment with 30 μl/ml of heptafluorobutyric anhydride (HFBA) before reproducible derivative formation and interference-free analysis could be achieved. This concentration of HFBA necessitated that excess reagent and by-products be removed before analysis. The effects of this and other modifications on former preparative procedures and recoveries are discussed. Analysis of the cleaned-up extracts by gas chromatography of the HFB derivatives using electron-capture detection was still impossible because of interference. The chromatographic properties of the three carbamates and their respective phenols on adsorption and reversed-phase high-performance liquid chromatography were determined and the applicability of the technique to the analysis of the cleaned-up extracts was investigated and found to be unsatisfactory. (Author abstract by permission)

80-3284. Herzel, F. (Inst. Wasser. Boden. & Lufthyg., Bundesgesundheitsamt, Berlin 33, BRD) **Zur Rueckstandsbestimmung von 2,6-Dichlorobenzonitril aus Boden und Wasser. [Determination of residues of 2,6-dichlorobenzonitrile in soil and water.]** *J. Chromatogr.* 193(2): 320-321; 1980 (2 references) (German).

A method for the extraction and determination of residues of 2,6-dichlorobenzonitrile (dichlobenil) in soil and water is described. The compound is extracted from water and from aqueous soil suspensions by distillation, and re-extracted from the distillate with toluene. 2,6-Dichlorobenzonitrile is determined in the toluene extract directly by gas chromatography, using 2% OV-101 + 3% QF1 on Chromosorb W AW DMCS (80-100 mesh) as column packing. The injector temperature is 170°C, the column oven temperature 125°C, and the electron capture detector oven temperature is 190°C. Nitrogen (30 mg/min) is used as a carrier gas. The recovery rate in the concentration range of 1-200 μg/kg soil or 1-200 μg/l water was found to be 92-93%.

80-3285. Picer, N.; Picer, M. (Cent. Mar. Res., Rudjer Boskovic Inst., Zabreb, Yugoslovia) **Evaluation of macroreticular resins for the determination of low concentrations of chlorinated hydrocarbons in sea water and tap water.** *J. Chromatogr.* 193(3): 357-369; 1980 (26 references).

The application of XAD-2, XAD-4 and Tenax macroreticular resins for concentrating chlorinated insecticides and polychlorinated biphenyls from sea and tap water samples was evaluated. The solvents used eluted not only the chlorinated hydrocarbons of interest but also other electron-capture detector sensitive materials, so that the eluates had to be purified. The effects of the adsorbent materials and solvent mixtures on the blank values and the sensitivity and reliability of the procedure investigated for the determination of hydrocarbons in sea and tap water are discussed. (Author abstract by permission)

80-3286. Cooke, M.; Roberts, D. J. (Dep. Inorg. Chem., Univ. Bristol, Bristol B58 ITS, England) **Carbon skeleton capillary gas chromatography.** *J. Chromatogr.* 193(3): 437-443; 1980 (16 references).

The integration of the micro-catalytic hydrodechlorination reaction with capillary gas chromatography to develop carbon skeleton capillary gas chromatography used for the determination of organochlorine pesticides is described. The system was used to study complex mixtures containing polychlorinated biphenyls and polychlorinated naphthalenes. The technique can determine the presence of a polychlorinated alkane residue in a sample.

80-3287. Sundaram, K. M. S.; Hindle, R. (Forest Pest Manage. Inst., Canadian For. Serv., Environ. Canada, Sault Ste. Marie, Ontario P6A 5M7, Canada) **Detection of aminocarb and its major metabolites by thin-layer chromatography.** *J. Chromatogr.* 194(1): 100-103; 1980 (6 references).

A thin layer chromatographic technique is described which gives good separation of aminocarb and its metabolites. The method is very sensitive and makes use of either a hexane-acetone or a diethyl ether-hexane-ethanol combination as the developing solvent on silica gel G or silica gel F254, along with two visualization techniques.

80-3288. Nieass, C. S.; Wainwright, M. S.*; Chaplin, R. P. (Sch. Technol., Univ. New South Wales, Kensington, New South Wales 2033, Australia) **Sampling and high-performance liquid chromatographic analysis of organic compounds in liquified carbon dioxide.** *J. Chromatogr.* 194(3): 335-341; 1980 (15 references).

A new technique for the sampling and analysis of solutions of organic compounds in liquified carbon dioxide (such as pesticides) is described. A high-pressure sample injection valve is incorporated in a commercial high-performance liquid chromatography instrument.

Pressurization of the solution diminishes the effects of nucleate boiling and gasification within the liquid phase. (Author abstract by permission)

80-3289. Cooke, M.; Ober, A. G. (Dep. Inorg. Chem., Univ. Bristol, Bristol BS8 1TS, England) **OV-17-QF-1 capillary column for organochlorine pesticide analysis.** *J. Chromatogr.* 195: 265-269; 1980 (14 references).

A new method developed for the separation and analysis of organochlorine pesticides is described. The gas chromatographic method employs a mixed phase partially-phenylated methyl silicone (OV-17) and trifluoromethyl-substituted methyl silicone (QF-1), capillary column. A simple coating procedure is described. The column appears to be stable for periods of greater than 3 mo. The method was tested using a solution containing standard organochlorine pesticides; α-BHC (lindane), aldrin, dieldrin, *p,p'*-DDE, *o,p'*-DDT, *p,p'*-DDT, and mirex. A typical chromatogram is presented, showing that peak shape and resolution are excellent.

80-3290. Hill, K. R. (SEA, USDA, Beltsville, MD) **A nitrogen-selective detector for liquid chromatography.** *J. Chromatogr. Sci.* 17(7): 395-400; 1979 (6 references).

The development of a nitrogen-selective detector for liquid chromatography is described. The detector is used directly on the effluent of a cleanup column to rapidly screen a wide variety of materials for the presence of pesticide residues. Excellent nitrogen-selective liquid chromatograms were obtained by combining a moving-wire transport system and a Hall conductivity detector. The system was tested for 17 pesticides and metabolites [atrazine, amitrol, benomyl, Bux (bufencarb), carbofuran and 2 metabolites, dimilin (diflubenzuron), dursban (chlorpyrifos), aldicarb and 2 metabolites, Baygon (propoxur), carbaryl, CG 19255, ETU (ethylene thiourea) and Zectran (mexacarbate)]. Extracts of alfalfa, animal fat, apples, eggs, soil, water and vegetable oil were fortified with the pesticide mixtures.

80-3291. Wright, B. W.; Lee, M. L.; Booth, G. M. (Dep. Chem., Brigham Young Univ., Provo, UT 84602) **Determination of triphenyltin hydroxide derivatives by capillary GC and tin-selective flame photometric detector.** *J. High. Resolut. Chromatogr. Chromatogr.* 2(4): 189-190; 1979 (6 references).

The determination of triphenyltin hydroxide (TPTH) and some of its possible degradation products by converting them to their methyl derivatives followed by glass capillary gas chromatography with a tin-selective flame photometric detector is described. Derivatization of triphenyltin hydroxide, triphenyltin chloride, diphenyltin dichloride, phenyltin trichloride, and bis-triphenyltin oxide is nearly quantitative with a minimum of redistribution products. The use of this method in the analysis of triphenyltin hydroxide in a fortified water sample is described, demonstrating its potential use in organotin residue chemistry.

80-3292. Dabrowski, J. (Inst. Pflanzenschutz, Poznan, Poland) **Methodische Hinweise zur gaschromatographischen Bestimmung von Kelevan und Kepone in Kartoffeln und Kartoffelkraut sowie in Boden. [Methodological hints to the gas chromatographic determination of kelevan and Kepone in potatoes, potato foliage and soil.]** *Nahrung* 23(1): 33-37; 1979 (3 references) (German).

In order to make a gas chromatographic determination of kelevan (ENT-27154), it must be first converted to Kepone (chlordecone). Kelevan is an ethyllaevulinic acid derivative of Kepone. Thermal decomposition in the injection block of the gas chromatograph at 45°C has been shown effective for routine work. Acetonitrile is used to extract the sample. Purification and concentration is carried out under reduced pressure. The determination of pre-existent Kepone and of kelevan (after thermal conversion to Kepone) was achieved through a Pye-Unicam gas chromatograph. Detection limits are 0.002 ppm for Kepone and 0.003 ppm for kelevan. Recovery of kelevan and Kepone added to control samples ranges from 63 to 88%.

80-3293. Shiga, N.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **[Direct determination of tricyclohexyltin hydroxide and its related compounds by atomic absorption spectrophotometry with graphite furnace atomizer.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(2): 255-261; 1980 (10 references) (Japanese).

Residue analysis for tricyclohexyltin hydroxide was carried out on green tea and orange sprayed with Plictran (cyhexatin) miticide. Analysis for tetracyclohexyltin, tricyclohexyltin hydroxide, dicyclohexyltin oxide, monocyclohexylstannoic acid, and inorganic tin was conducted by atomic absorption spectrophotometry with a graphite furnace atomizer. The lower limits of detection were 0.5 ng tin for monocyclohexylstannoic acid and 0.2 ng tin for the others. Tricyclohexyltin hydroxide in green tea or orange was extracted with *n*-hexane and acetic acid. The residue was purified by column chromatography. Lower limits of detection were 0.05 ppm in 5 g green tea, 0.01 ppm in 20 g orange peel, and 0.006 ppm in 50 g orange flesh and juice. Recoveries from green tea, orange flesh, orange peel, and orange juice were 91, 94, 82, and 109%, respectively.

80-3294. Thielemann, H. (Lehrstuhl Allg. & Kommun. Hyg., Hyg. Inst., Martin-Luther Univ., Halle-Wittenberg,

DDR) 1,4-Dihydroxybenzen als Detektionsmittel fuer den dc Nachweis von *p,p'*-DDT. [The use of 1,4-dihydroxybenzene for the TLC detection of *p,p'*-DDT.] *Pharmazie* 35(5-6): 329; 1980 (German).

A 5% solution of 1,4-dihydroxybenzene in acetone is reported to be useful in chromatographic identification of the insecticide *p,p'*-DDT on commercial UV 254 foil. Dark spots against a light background appear upon development with *n*-hexane after 30 min. The visual detection threshold is 1 μg, semiquantitative analysis is feasible above 10 μg. None of the organochlorines *o,p'*-DDT, *p,p'*-DDE, *p,p'*-DDT, *p,p'*-DDD (TDE) and PCB's, yielded a similar reaction.

80-3295. Kamimura, H.; Nishijima, M.; Nagayama, T.; Yasuda, K.; Saito, K.; Ibe, A.; Ushiyama, H.; Naoi, Y. (Tokyo Metrop. Res. Lab. Public Health, Shinjuku-ku, Tokyo, Japan) **[Analytical procedure for total bromide in agricultural products (studies on bromide residues in agricultural products and processed foods, I).]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 21(3): 214-218; 1980 (9 references) (Japanese).

The analytical capabilities of a detector tube for qualitative and quantitative determinations of bromide residues in agricultural products are described. More than 97% of the bromide added to rice, wheat, chestnut, and cherry were recovered, with detection limits of 1 ppm. Analysis was performed by adding 20 g of sample to 25 ml alkaline monoethanolamine, ashing, and then dissolving the residue in 0.1 N NaOH. Potassium permanganate (0.5 g) and phosphoric acid (5 ml) were then added. The reactor tube was assembled and air bubbled through the system for 3 hr. The color change in the tube reflected bromine reaction with fluorescein to produce tetrabromofluorescein; the color changed from yellow to reddish-pink. The authors content this method is satisfactory for detection of total bromide in agricultural products.

80-3296. Jackson, M. D.; Soileau, S. D. (Health Effects Res. Lab., Research Triangle Park, NC) **A one step method for the determination of carbamate pesticides by derivatization with α-bromo-2,3,4,5,6-pentafluorotoluene.** *US NTIS PB Rep.* PB-142,847: 106 pp.; 1980 (40 references).

A procedure was developed for the determination of trace quantities of a broad range of carbamate pesticides. The carbamates were hydrolyzed and derivatized in a single step, using alkali and α-bromo-2,3,4, 5,6-pentafluorotoluene (PFBB), and were subsequently analyzed using electron capture gas chromatography. This one step derivatization method created a novel derivative in which one fluorine on the PFB ring was displaced by an ethoxide ion via aromatic nucleophilic substitution. (Author abstract by permission)

80-3297. Leshchev, V. V.; Ermakov, V. V. (All-Union Res. Inst. Vet. Sanit., Moscow, USSR) **Kolichestvenhoe opredelenie khlorofosa i DDVF. [Quantitative determination of chlorophos and DDVP.]** *Veterinariya (Moscow)* 6: 63-64; 1980 (Russian).

Chlorophos (trichlorfon) and DDVP (dichlorvos) can be determined in biological samples (milk and animal tissues) by enzymatic and biological detection, thin-layer chromatography, or gas chromatography. Gas chromatography offers the advantages of quantitative determination, specificity, and small sample sizes. For the determination, organ homogenates or milk are extracted with acetone containing a small amount of acetic acid, filtered, mixed with chloroform, the chloroform layer dried with anhydrous sodium sulfate, the solvent evaporated, the residue taken up in acetone, and chromatographed. The column used is a glass column, packed with polysorb-1. The column is maintained at 1700C, and a thermionic detector is used. The detection limit is 0.01 mg/kg for chlorophos and 0.02 mg/kg for DDVP. The recovery rates are 80% and 55%, respectively.

80-3298. Banks, P. A.; Merkle, M. G. (Soil & Crop Sci. Dep., Texas Agric. Exp. Stn., Texas A&M Univ., College Station, TX 77843) **Soil detection and mobility of fluridone.** *Weed Sci.* 27(3): 309-312; 1979 (7 references).

Bioassay and gas chromatographic procedures were evaluated for their effectiveness in detecting fluridone {1-methyl-3-phenyl- 5-[3-(trifluoromethyl) phenyl]-4(1*H*)-pyridone} in soil. Bioassay procedures were limited to a detection range of 0.05 to 0.45 ppmw if grain sorghum *[Sorghum bicolor* (L.) Monech] was used. Visual estimations of chlorophyll content in affected plants, used as an indicator of fluridone concentration, were as reliable as spectrophotometric determinations. Gas-liquid chromatographic (GLC) procedures were less variable than the bioassay and had no upper limit of detection. Recovery of fluridone from treated soil ranged from 60 to 100%, depending on soil type. Soil water content affected percent recovery. Fluridone did not leach more than 1 cm in clay or sandy loam soils when up to 10 cm of water was passed through a soil column containing the herbicide, as determined by GLC. Extensive downward movement, 12 to 17 cm, occurred in a coarse sand when 5 or 10 cm of water was passed through the column. (Author abstract by permission)

80-3299. Golovkin, G. V.; Smol'chenko, A. I.; Zotov, L. N.; Sazonov, S. E. (All-Union Sci. Res. Inst. Chem. Plant Prot., Moscow, USSR) **Sistemy gazokhromatograficheskikh indeksov uderzhivaniyadlya identifikatsii pestitsidov s primeneniem selektivnykh detektorov. [Systems of gas-chromatographic retention indices for identification of pesticides using selective detec-**

tors.] *Zh. Anal. Khim.* 35(5): 964-968; 1980 (9 references) (Russian).

A homologous series of trichloroacetic acid esters was employed for an electron-capture detection system coupled with gas chromatographic analysis of pesticides. Trialkylphosphates were used for a thermionic detector, and a series of symmetric dialkylsulfides was used for a flame-photometric detector to detect sulfur compounds. The corresponding halogen, phosphorus or sulfur retention indices were recalculated into Kovats indices and vice versa. A number of pesticides in environmental samples were reliably identified by these procedures using three polysiloxane stationary phases SE-30, OV-17 and XE-60.

80-3300. Golovnya, R. V.; Golovkin, G. V.; Zotov, L. N. (All-Union Sci. Res. Inst. Chem. Plant Prot., Moscow, USSR) **Primenenie ekvivalentnogo izotermicheskogo indeksa uderzhivaniya dlya identifikatsii serosderzhashchikh pestitsidov. [Use of equivalent isothermal retention index for identification of sulfur-containing pesticides.]** *Zh. Anal. Khim.* 35(7): 1335-1341; 1980 (22 references) (Russian).

Symmetric *n*-dialkylsulfides were used to calculate retention indices for polar sulfur-containing pesticides under conditions for isothermal analysis and linear temperature programming rather than using *n*-alkanes. The use of *n*-dialkylsulfides makes it possible to employ a selective flame-photometric detector for pesticide identification. Optimal conditions are tested for the analysis of sulfur-containing pesticides using linear temperature programming from 130 to 210°C at 4-5°/min. The equivalent isothermal index can identify polar pesticides using gas chromatography equipment with linear temperature programming on columns with SE-30, OV17 and XE-60. Retention indices for 5 pesticides [diazinon, heterofos, Ricid P, malathion and butifos (DEF)] were determined. The indices and the equivalent isothermal index are useful for identifying sulfur-containing pesticides in mixtures.

See also 80-3007, 80-3008, 80-3054, 80-3058 *and* 80-3071.

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